

# **EcoOnline™**

## ***OKU Panel Solar Pool Heating System***

### **Installation and User Manual - Revised 29/09/2015**



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## 1 Key Terms

This manual was written to follow guidelines and recommendations given in:

- AS 3634 - 1989 Solar heating systems for swimming pools
- AS 1170.2 - 2011 (Amend 2 Dec 2012) Structural design actions - Wind actions
- 'HAZPAK' produced by the work-cover authority
- AS 3000 (2007) Sections 6.3, 6.4 & 6.5
- AS 1926.1 & 1926.2 (2007) swimming pool safety - location of safety barrier

Please take the time to read this manual before starting any work. Particular attention should be given to text contained in the following key terms.

Please note EcoOnline has a strong product safety policy; do not install products without reading safety guidelines in the manual. Please report any product safety issues or near misses to info@EcoOnline.com.au no matter how trivial.

	Indicates a <b>SAFETY</b> issue that <b>is likely to</b> cause injury or death if the user does not follow the instructions. <b>DANGER</b>
	Indicates a <b>SAFETY</b> issue that <b>may</b> cause injury or death if the user does not follow the instructions. <b>WARNING</b>
	Indicates a <b>SAFETY</b> issue that <b>may</b> cause injury or property damage if the user does not follow the instructions <b>CAUTION</b>
	Refers to <b>critically important</b> information related to the <b>correct functioning</b> of the system. <b>Read Carefully</b>
	Refers to useful information for the <b>optimal operation</b> of the system <b>Tip</b>
<b>Why?</b> <i>Italic text is optional reading. Gives extra information and reasoning for recommendations that are non-obvious and/or counter intuitive.</i>	

## 2 Pre-Installation Suitability & Safety Checklist

The following outlines mandatory suitability and safety requirements for installing this solar heating system. Please read carefully, if any of the following requirements cannot be met the system should NOT be purchased or installed.



DANGER

For ground level collector installations the installer **MUST** check child safety fence regulations in the relevant state. **Under no circumstances should collectors be installed so as to compromise the effectiveness of a child pool or spa fence safety barrier by providing a climbable object.**



DANGER

Due to the potential of falling from heights, mounting the solar panels on a roof or structure at heights should only be undertaken by a professional solar panel installer, unless you are accustomed to and confident of performing the work safely.



WARNING

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.



WARNING

At present this collector array system is **not recommended for installations in cyclonic regions C or D, or on houses situated on top of hills exposed to strong winds, or on second story (or higher) roofs.** Installations on tiles are for Wind Region A only.



CAUTION

Collectors are to be used with **chlorinated (or otherwise sanitized) pool water ONLY.** Do not use collectors to heat **fresh (untreated) water** due to the potential for Legionaries bacteria build up.



CAUTION

Building regulations vary from state to state and **MUST** override any instructions supplied in this manual. It is the responsibility of the purchaser/installer to check that installations comply with any relevant state laws and regulations.

### 3 Warranties

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EcoOnline™ offers the following Warranties

- 5 year limited Warranty on all OKU collectors
- 2 year Warranty on Reltech Pool Pumps
- 3 year Warranty on Davey Pool Pumps
- 2 Year Warranty on Dontek Controllers

See EcoOnline.com.au [Terms and Conditions](#) page for further details.



**Customer please note: WARRANTY IS VOID if collectors are installed:**

**Read Carefully**

- without a **vacuum release valve** on the return line,
- or a **non-return valve** on the solar pump outlet (with 6mm drain hole in flap),
- or **with a grossly oversized pump**,
- or **in a manner that prevents collector from fully draining** when the pump stops,
- or if the collectors are installed **below the water level**.

***Why?** Such installations will expose the collectors to strong fatiguing positive/negative pressures, and/or stagnant hot chlorinated water on hot days. These situations will have detrimental effects on the collectors which will limit lifetimes and can also result in significant shrinkage of the collectors which would put strain on roof attachments means.*

### 4 System Sizing Guarantee

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Sizing systems is difficult involving a lot of factors which we could get wrong. Hence in addition to the above Warranties EcoOnline offers a System Sizing Guarantee as follows. If we sized your system (or you use our online calculator) and you took our advice and you aren't happy with the systems performance (heat output), then you can purchase *up to 25% more* panels originally supplied by EcoOnline **up to two years** after your original purchase and we will ship the items **free of shipping charges**.

### 5 Collector Sizing Guide

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An interactive collector sizing calculator can be found on our website at:

<http://www.EcoOnline.com.au/product-information/solar-pool-heating/sizing-guide>

## 6 Pool Chemistry Compatibility Guide



CAUTION

This system is **not compatible with bromide chlorination, hydrochloric acid use and/or acidic pool/spa water (pH less than 7.2)**. Sodium Carbonate must be added to protect the system from acidic pH (<7). pH should be maintained between 7.2-7.8 for maximum system longevity. If absolutely required Sodium Bisulphate acid can be used to keep the pH down.

**Why?** Acidic water with pH less than 7.0 has excess free H+ ions which like to bond to and hence break apart polymer carbon and silicon bonds.

Incompatible Chemistries	Alternatives Chemistry
✗ Bromide Based Chlorination	✓ Any other Chlorination or Sanitation
✗ Hydrochloric Acid	✓ Sodium Bisulphate Acid
✗ Acidic Water (pH less than 7.2)	✓ Water pH greater than 7.6

## 7 Pump Sizing Guide

### 7.1 Solar Pump Sizing for Independent Systems

Due to the low pressure drop across OKU collectors, the recommended pump size **for independent type systems** is determined by the minimum and maximum turn-over of water required. Note: **recommendations are in pump input watts not output watts**, these specs should be marked on the pump.

Recommended Input Pump Power for Independent Systems			
Pool Water Volume	Min - Max Recommended Flow	For 1 <sup>st</sup> Story Install (3m):	For 2 <sup>nd</sup> Story Install (6m):
		Min - Max Input Pump Watts	Min - Max Input Pump Watts
20,000 L	50 - 67 L/min	270 - 300 Watts	350 - 380 Watts
25,000 L	63 - 83 L/min	300 - 330 Watts	370 - 410 Watts
30,000 L	75 - 100 L/min	320 - 370 Watts	400 - 450 Watts
35,000 L	88 - 117 L/min	340 - 400 Watts	420 - 480 Watts
40,000 L	100 - 133 L/min	360 - 440 Watts	450 - 520 Watts
45,000 L	113 - 150 L/min	390 - 470 Watts	470 - 560 Watts
50,000 L	125 - 167 L/min	420 - 510 Watts	500 - 600 Watts
55,000 L	138 - 183 L/min	450 - 560 Watts	530 - 640 Watts
60,000 L	150 - 200 L/min	470 - 600 Watts	560 - 690 Watts
65,000 L	163 - 217 L/min	500 - 640 Watts	600 - 740 Watts
70,000 L	175 - 233 L/min	530 - 700 Watts	620 - 790 Watts
75,000 L	188 - 250 L/min	570 - 740 Watts	660 - 840 Watts
80,000 L	200 - 267 L/min	600 - 790 Watts	700 - 900 Watts

If you don't know your pools water volume you can look it up from the table supplied below based on the total water area and average depth:

Pool Water area vs Average Depth Conversion Table									
	Average depth								
Waters Area	1.3 m	1.4 m	1.45 m	1.5 m	1.55 m	1.6 m	1.65 m	1.7 m	1.8 m
10 m <sup>2</sup>	13000 L	14000 L	14500 L	15000 L	15500 L	16000 L	16500 L	17000 L	18000 L
15 m <sup>2</sup>	19500 L	21000 L	21750 L	22500 L	23250 L	24000 L	24750 L	25500 L	27000 L
20 m <sup>2</sup>	26000 L	28000 L	29000 L	30000 L	31000 L	32000 L	33000 L	34000 L	36000 L
25 m <sup>2</sup>	32500 L	35000 L	36250 L	37500 L	38750 L	40000 L	41250 L	42500 L	45000 L
30 m <sup>2</sup>	39000 L	42000 L	43500 L	45000 L	46500 L	48000 L	49500 L	51000 L	54000 L
35 m <sup>2</sup>	45500 L	49000 L	50750 L	52500 L	54250 L	56000 L	57750 L	59500 L	63000 L
40 m <sup>2</sup>	52000 L	56000 L	58000 L	60000 L	62000 L	64000 L	66000 L	68000 L	72000 L
45 m <sup>2</sup>	58500 L	63000 L	65250 L	67500 L	69750 L	72000 L	74250 L	76500 L	81000 L
50 m <sup>2</sup>	65000 L	70000 L	72500 L	75000 L	77500 L	80000 L	82500 L	85000 L	90000 L
55 m <sup>2</sup>	71500 L	77000 L	79750 L	82500 L	85250 L	88000 L	90750 L	93500 L	99000 L

## 7.2 Solar Pump Sizing for Booster Systems



Read Carefully

**For booster type systems** you should choose a pump at or just below the minimum specs in the table above as these systems are already pressurized by the filter pump.

## 7.3 Filter Pump Sizing for Manual Systems



Read Carefully

**For manual type systems** running off a main pool filter pump, please check that the filter pump is large enough to accommodate the extra load of supplying water to the collectors at the required pump height + a 1 meter pressure drop across the collector array.

## 8 Solar Line PVC Pipe Sizing Guide

The table below will help you choose the correct size PVC pipe for the **solar lines** running to and from your roof.

Minimum Recommended Piping Size for Solar Pool Heating System Lines	
Maximum Anticipated Flow Rate	Minimum PVC Pipe Size
0 - 70 Litres/min	Use larger than 20 mm
70 - 120 Litres/min	Use larger than 25 mm
120 - 200 Litres/min	Use larger than 32 mm
200 - 250 Litres/min	Use larger than 40 mm
250 - 400 Litres/min	Use larger than 50 mm
400 - 880 Litres/min	Use larger than 80 mm



CAUTION

You should check that your pump does not exceed the maximum recommended water flow rate for the PVC piping size based on the table above.

## 9 Roof Type Compatibility Guide

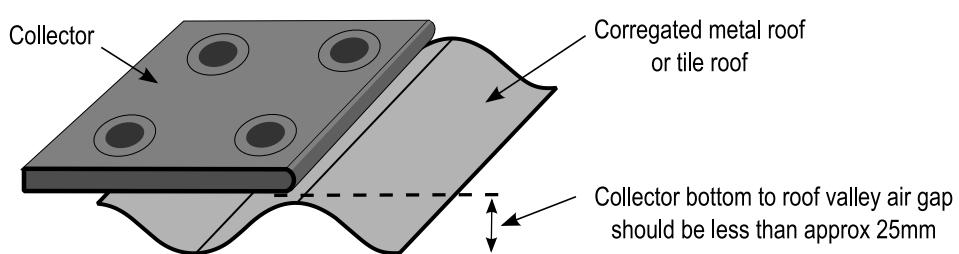


WARNING

If panels are to be installed on a roof then the following should be observed to limit wind uplift potential.

- 1) **Installed panels should lay flat touching the roof structure.** It is recommend the air gap distance between the bottom of the installed collector and the valley points of the roof corrugations should be no greater than approximately 25mm.
- 2) **Panels should have adequate clearance from roof edges.**
- 3) **Panels on roofs should not be mounted on tilt frames.**

**Why?** *The average air gap distance between the mounted collector and roof structure has a strong influence on wind loadings. Furthermore due to roof edge turbulence effects wind loadings are highest near roof edges.*



Roof Type	Peak to Valley Measure	Recommendation
Standard Corrugated Iron roof (Custom Orb)	17mm	Okay
Relatively Flat Tile roof	Less than 25mm	Okay
Spandek Iron roof	24mm	Okay
Modulated Tile roof	Greater than 25mm	Region A Only
Trimdek Iron roof	29mm	Region A Only
Klip-lok Iron roof	43mm	Not Recommended
Flatdek Iron roof	45mm	Not Recommended



WARNING

Panels installed above the roof structure with 50mm or greater underneath air gaps experience much higher wind loadings and are now subject to the Australian wind loading standard AS/NZD 1170.2.

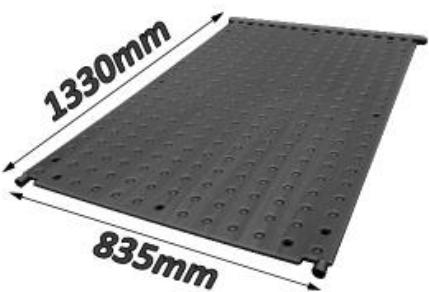
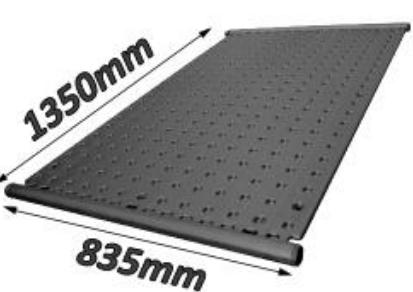
## 10 Wind and Climate Considerations

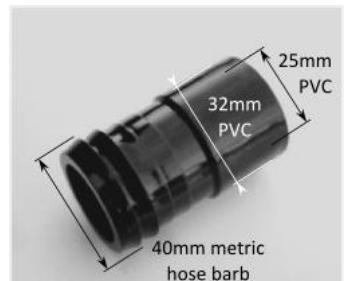


CAUTION

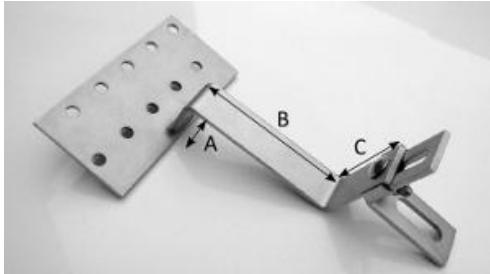
It is the responsibility of the installer to consider wind loading factors, see “wind proofing” section below. **If the installation site is within strong wind speed areas then the extra stainless steel guide line must be installed across each row with the in-between panel anchor points.** Do not assume supplied components are sufficient.

## 11 Collector Array Components

Interconnect OR Dual Header Panel Kit:	
 <p>1 x HDPE interconnect panel</p>	 <p>1 x HDPE dual header panel</p>
  <p>1 x 40mm reinforced silicon joiner 1 x 25mm reinforced silicon joiner 4 x Stainless steel hose clamps 3 x 316 Stainless steel straps (black) 1 x 50cm length perforated 316 stainless band</p>	 <p>2 x 40mm reinforced silicon joiners 4 x Stainless steel hose clamps 6 x 316 Stainless steel straps (black) 1 x 25cm length perforated 316 stainless band</p>

Other Collector Array Components	
 <p>1 x 32mm/40mm PVC Vacuum breaker valve (MUST be installed)</p>	 <p>2 x 40mm hose barb to 25mm/32mm PVC glue socket/take off</p>

### Roof Mounting (Solar roof hook supplied only if requested and purchased)

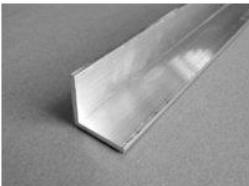


1 x 304 Stainless solar roof hook (height adjustable)

Dimensions: A = 47.5mm, B = 117.5mm, C = 60mm

## 12 Additional Required Components (Not Supplied)

You also require some of the following extra items depending on your system. These are available in any plumbing store. The aluminium angle is available from Capral Ltd. or Ullrich Aluminium Pty. Ltd.

			
30-32mm x 30-32mm x 3-4mm Aluminium angle	4mm stainless steel cable & four cable ties per row	PVC piping	PVC bits



We recommend **AS 1477 compliant PVC piping with PN9 pressure rating or greater** and matching PVC fittings be used for all collector array plumbing.

CAUTION

## 13 Required Tools

- Battery powered hand drill	- Screwdriver	- Safety glasses
- Corking gun (for Silicon glue)	- Hack saw	- Gloves
- Sun/UV protection	- Assorted drill bits	- Power Lead
- Teflon tape (for any threaded fittings)	- Tape measure	- Tin snips
- Industrial Ladder	- Needle nose pliers	- Power Lead

## 14 Safety When Working at Heights



**DANGER**  
**WHEN WORKING AT HEIGHTS - SAFETY COMES FIRST.** A person can easily fall off a ladder or roof and be seriously injured. For installations on a roof pitch greater than 22° and/or a double story house we strongly recommend a highly competent professional installer install your solar collector array. The installer **MUST** use an appropriate safety harness.

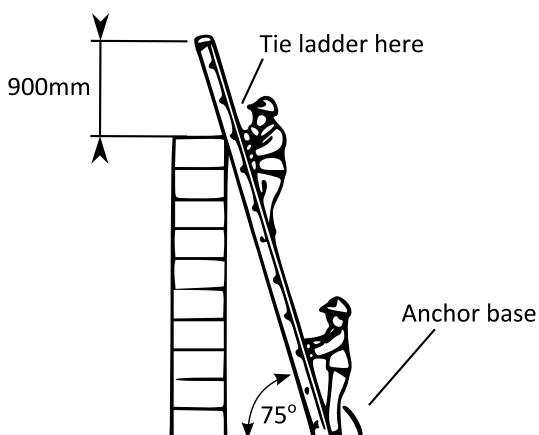


**WARNING**  
The collectors can be walked on without damage. Take extreme care to use non-slip shoes and **never walk on wet collectors**, especially on installations with any significant pitch. **HDPE material is a slippery and waxy surface. If the collectors need to be walked on for mounting purposes, ALWAYS use a safety harness and fall arrest system.**

The installer should always take the necessary safety precautions:

- Choose an appropriate day: cool, dry, calm and partly cloudy.
- Plan out your install: make sure you have all required components, tools and have plenty of allocated time.
- Only work at heights when you are well rested and alert.
- Never work alone, always work with at least one other person.
- Always use a safety harness or fall arrest system attached to appropriate roof anchor points.
- Wear clothes that fit well but that do not restrict movement.
- Use proper non-slip shoes.
- Use sunscreen.

## 15 Ladder Safety



**The chance of a falling from a ladder should never be underestimated.** Use only solid **industrial grade ladders** in good repair that have been checked for faults.

**Note: even a small unexpected movement of the ladder, such as a small slip, can cause loss of balance and result in a fall.**

The ladder should be placed on solid ground and should **ALWAYS** be securely anchored at the base and secured at the top to prevent slipping.



**DANGER**

Solar panels should not be mounted in windy or gusty conditions; a panel can easily be caught in the wind and cause a loss of balance and result in a fall.

## 16 Choosing a Place to Install the Collector Array

When choosing a location for your collector array you should consider:

- **Shading** - the collector array should receive no shading between the hours 10am to 4pm.
- **Wind** - the collector array should be mounted in a relatively sheltered location or with appropriate wind proofing.
- **Distant to pool/spa** - collectors should be as close as possible to your pool (or spa).
- **Direction** - collectors should preferably face **northwest for maximum heat collection**; however the collector array can also face any angle between Northeast to West.
- **Mounting elevation** - this depends on the desired seasonal heat collection. Flatter elevations (< 45°) collect more heat in the summer while installations closer to vertical (> 45°) produce more heat during spring/autumn.

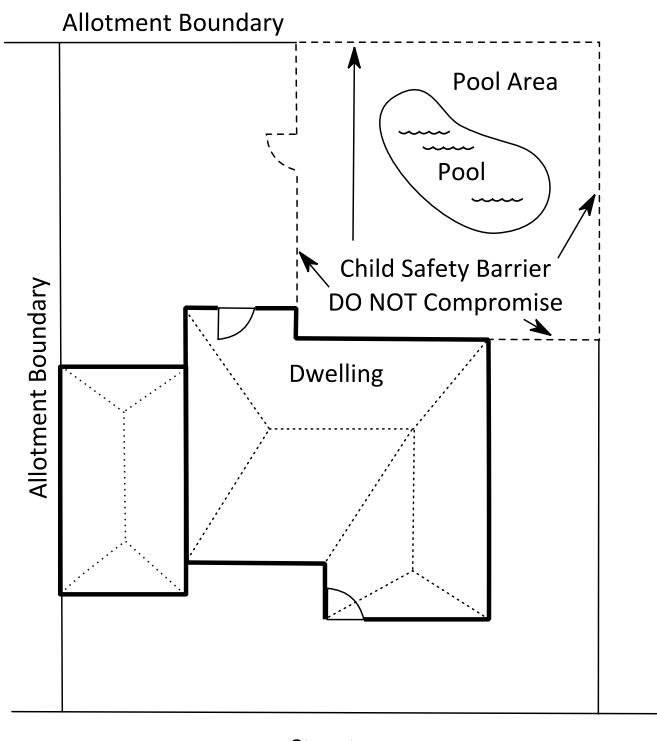


The collector array can face anywhere from West to North-east, with an optimal orientation of North-west for most areas. All other orientations are not recommended.



DANGER

**For ground mounted arrays, under no circumstances should a collector array be mounted in anyway so as to compromise the effectiveness of a pool or spa Child Safety Barrier.**



The figure to the left shows an example of a Child Safety Barrier marked with a dashed line. A collector array should not be mounted near the Child Safety Barrier - **both on the inside and outside of the Pool Area** unless proper clearances are observed. **Consult your Local Government, The Building Commission or SPASA for details regarding pool safety barriers in your state.** Please keep up to date with regulations as they change over time. For more information see, AUSTRALIAN STANDARDS 1926.1 2007 AND 1926.2 2007 FOR POOL SAFETY BARRIERS.

- Do not install the collectors **leaning against the outside of a Child Safety Barrier** so as to create a climbable object for children to access the pool or spa.
- Collectors installed inside the pool area in front of a boundary fence must be offset away from the boundary fence with the **proper clearance** from the top of the fence so as not to provide a foothold for a child climbing into the pool area.

- Do not install the collectors too close to the inside of a Child Safety Barrier so as to provide **foot or handholds from the outside** of the barrier.
- For spa baths and above ground pools do not lean the collector array against the side of the spa or pool so as to create a **ramp or climbable object**.

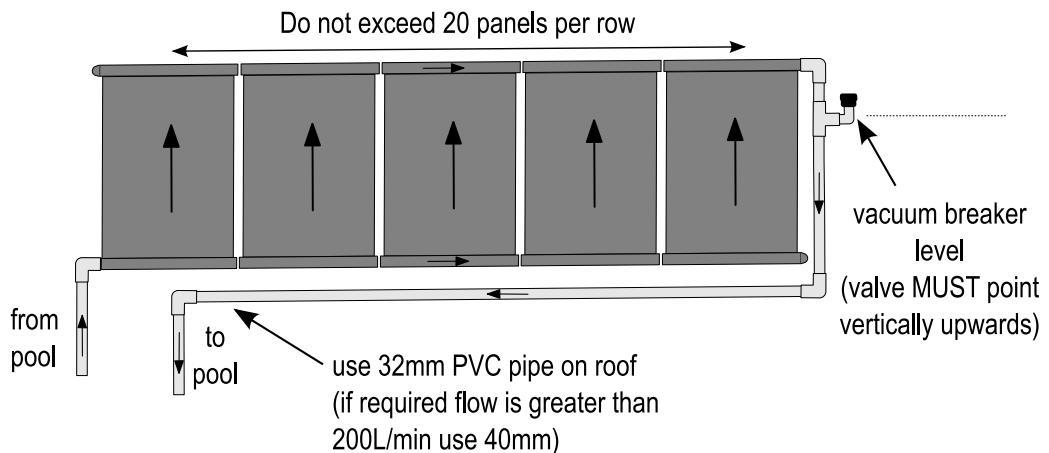
## 17 Collector Array Configurations



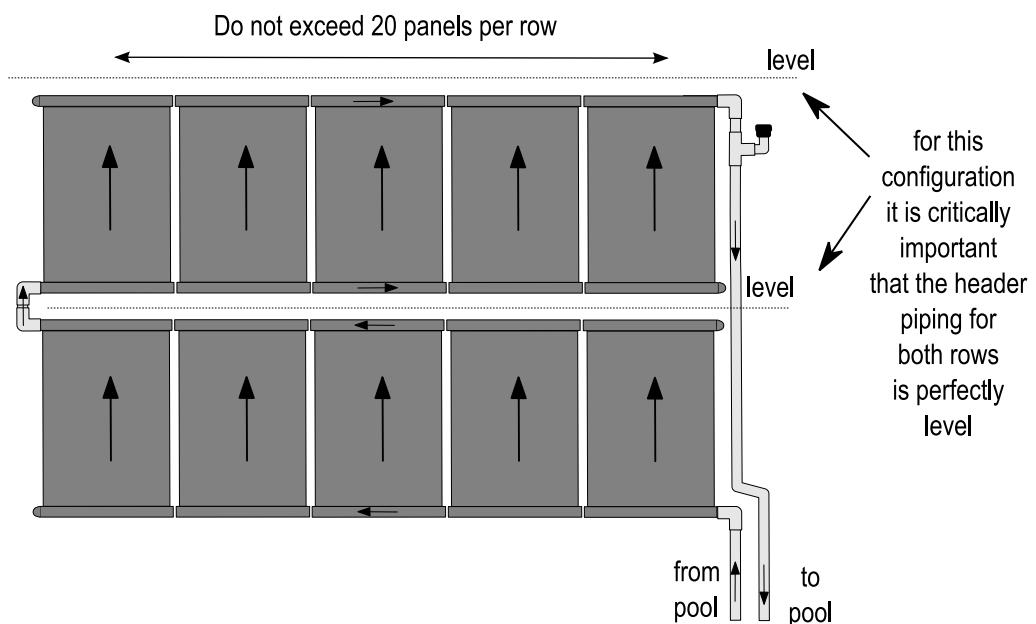
All collector array configurations must be installed with a **vacuum release valve** on the return line and a **non-return valve** on the pump side.

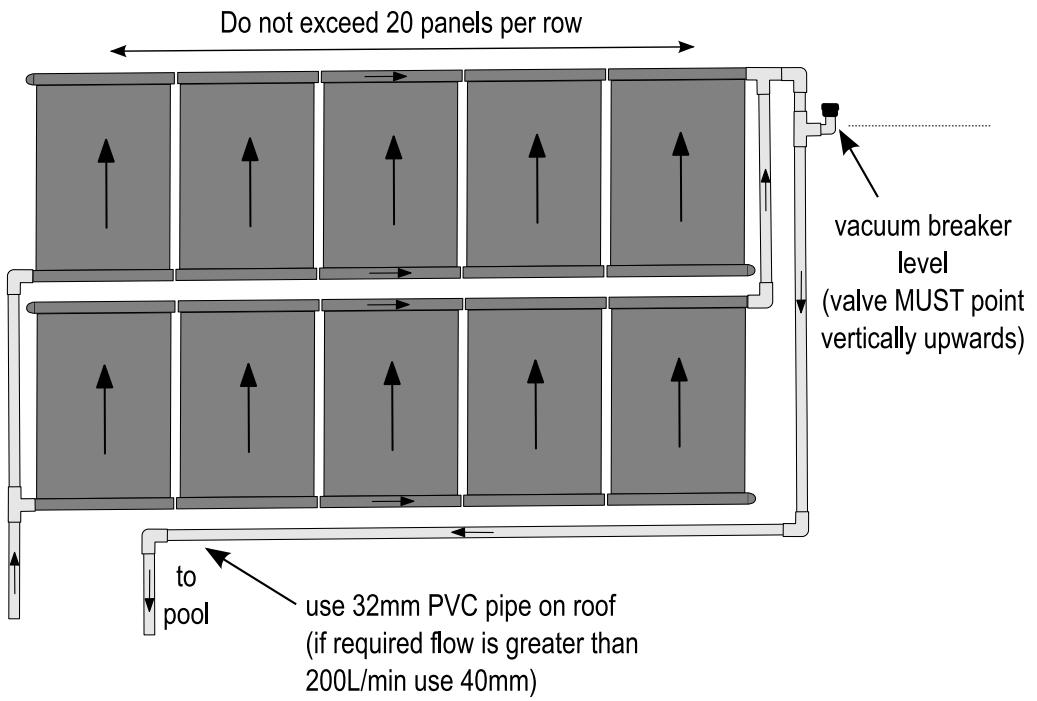
CAUTION

### 17.1 Dual Header Panel Single Row Array Configuration

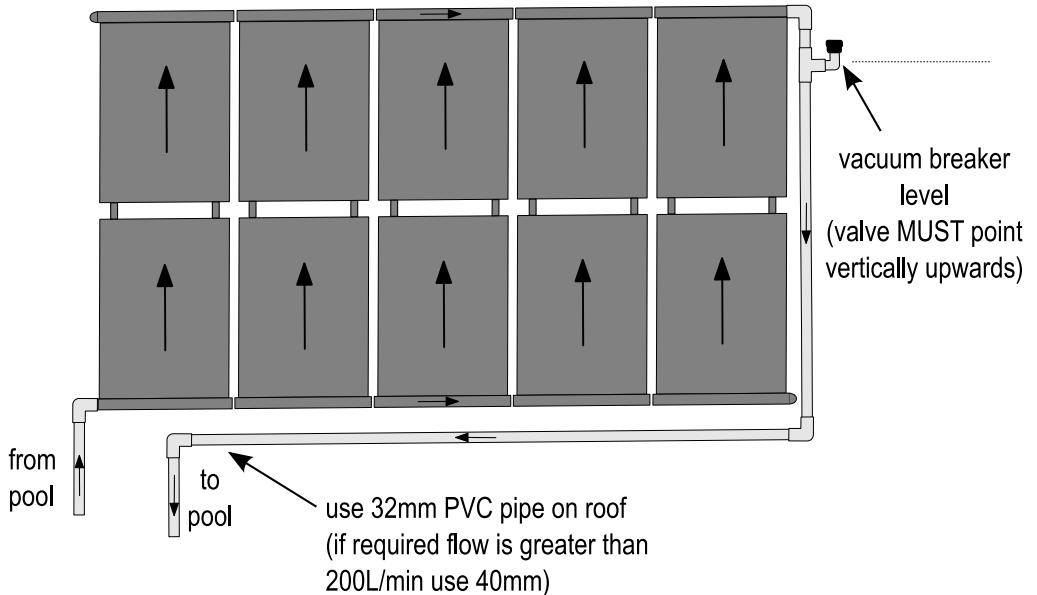


### 17.2 Dual Header Panel Two Row Array Configurations

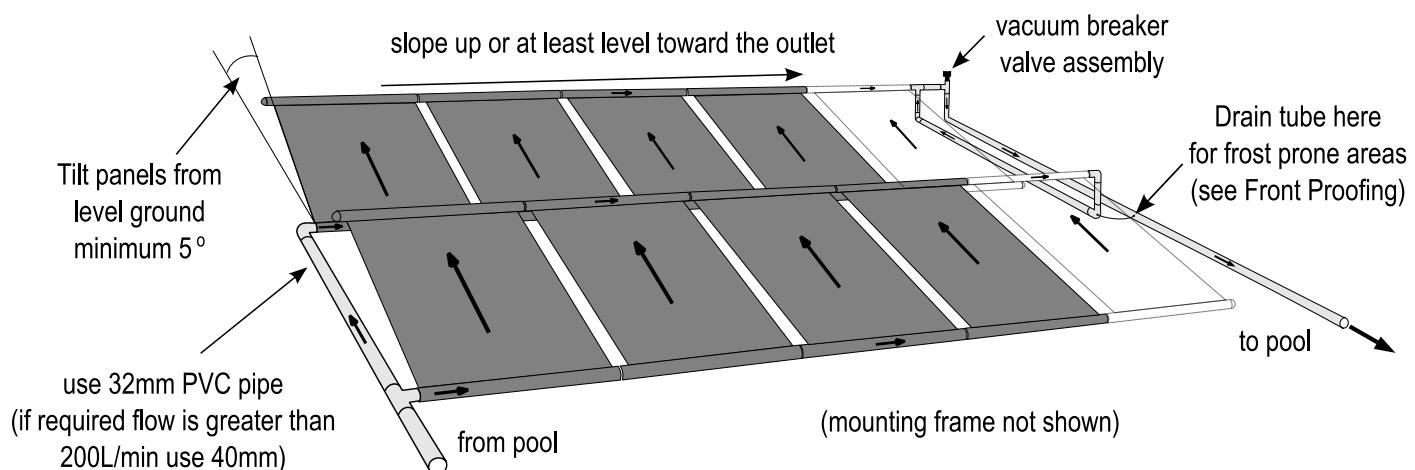




### 17.3 Interconnect Panel Array Configuration



## 17.4 Collector Array Configuration for Level Ground Surfaces



**For ground mounted arrays, under no circumstances should a collector array be mounted in anyway so as to compromise the effectiveness of a pool or spa Child Safety Barrier.**

DANGER

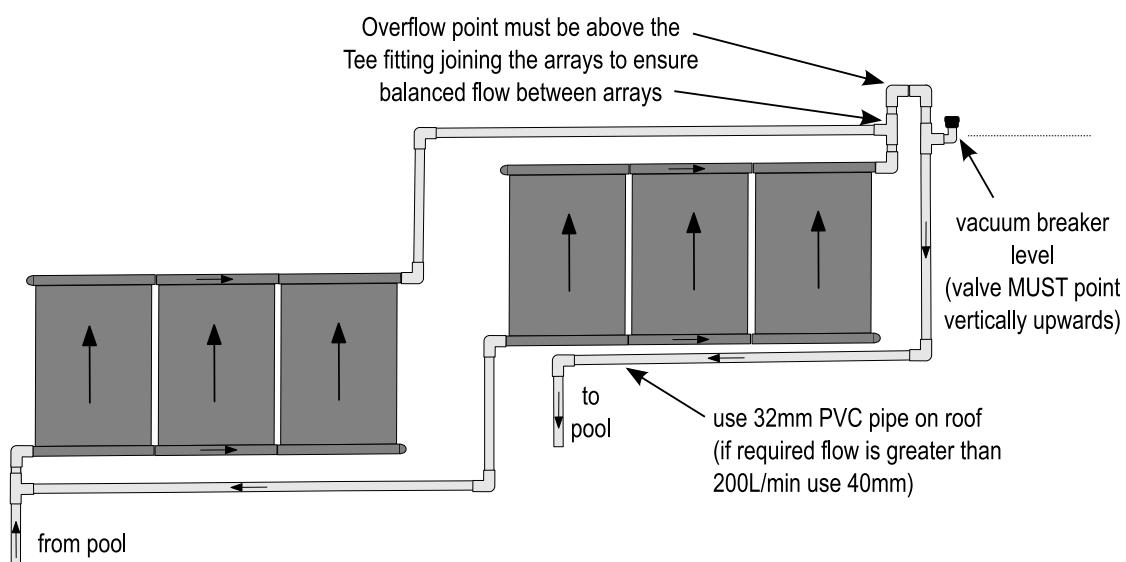
## 17.5 Split Collector Array - Similar Level Configuration



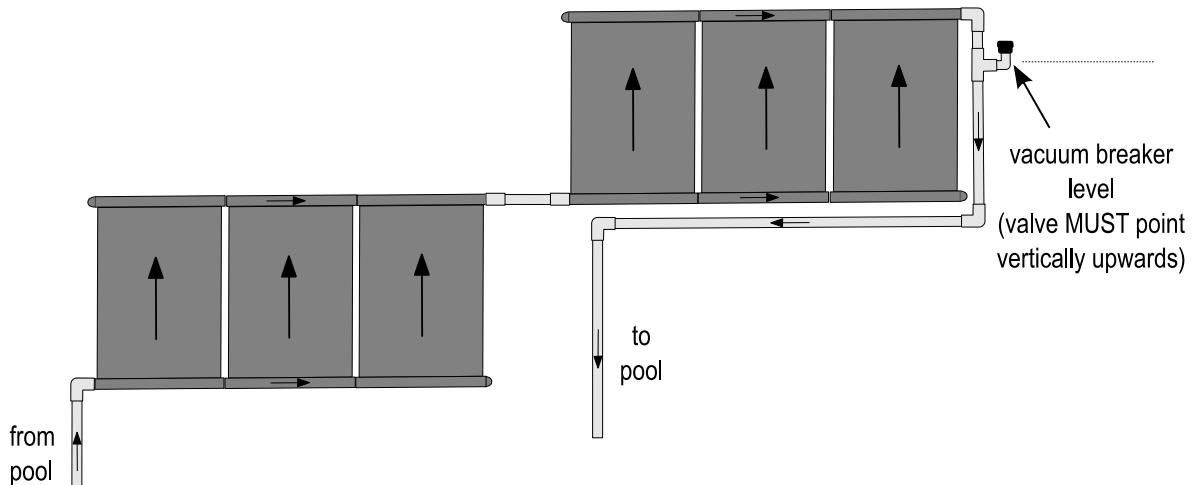
Read Carefully

Split collector arrays should be installed facing the same direction - **or have no more than 30° compass facing difference between them**. In this later case the temperature sensor should be installed at an angle that is an average of the two collector array compass facing directions.

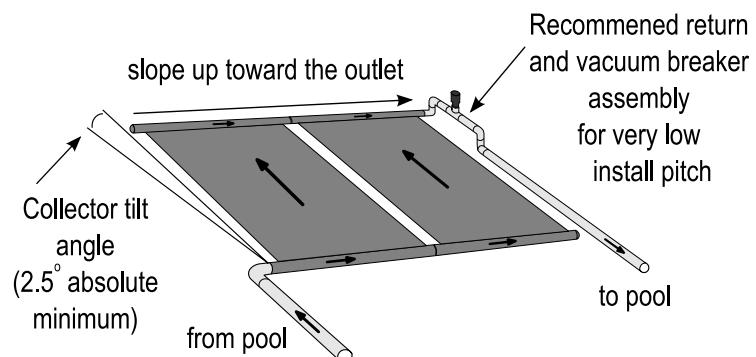
**Why?** Depending on the location of the roof sensor the controller could turn the system on with one bank of collectors in full shade.



## 17.6 Split Collector Array - Higher Level Configuration



## 17.7 Recommended Return Line Configuration for Low Roof Pitch ( $2.5^\circ$ - $5^\circ$ )



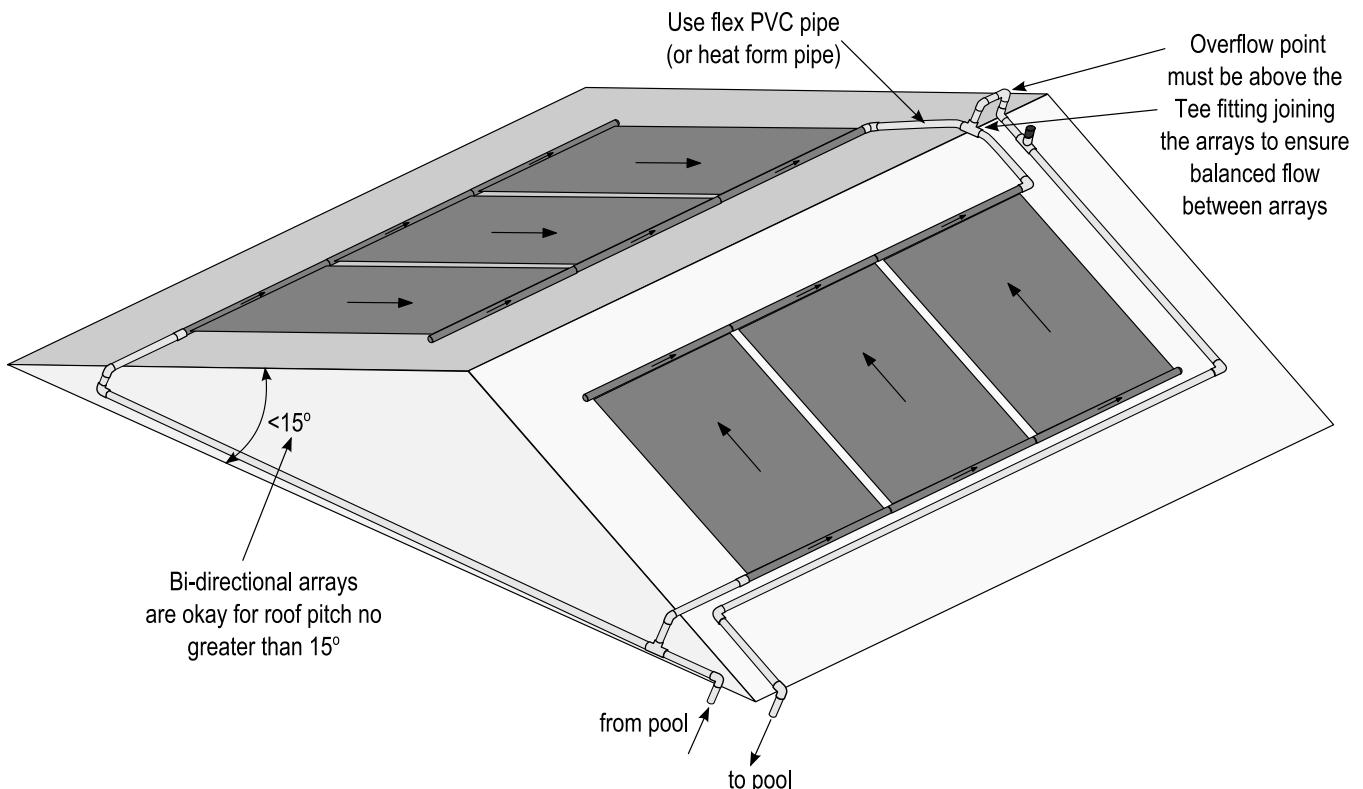
## 17.8 Bi-Directional Arrays



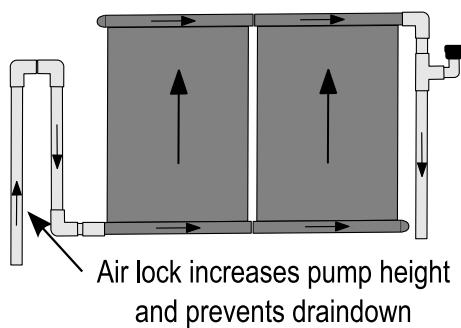
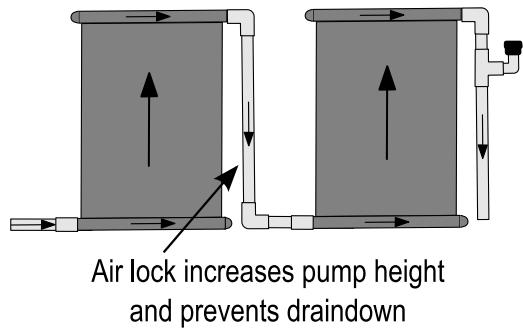
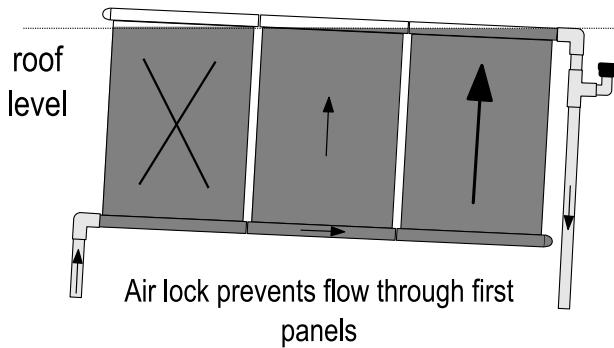
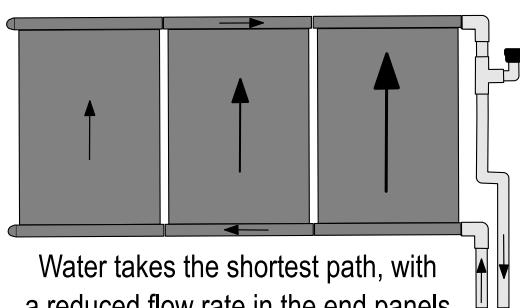
Read Carefully

**Collector arrays that face opposing compass directions are not recommended unless the roof pitch is less than ~15°.** In this case the temperature sensor should be installed at an angle that is an average of the two collector array directions.

**Why?** Depending on the location of the roof sensor the controller could turn the system on with one bank of collectors in full shade.



## 17.9 Plumbing Configurations Not Recommend



Read Carefully

To make sure all air bubbles are evacuated upon filling collector **MUST** be installed with a minimum recommended pitch of 5°.



Read Carefully

Ideally the collector array top header pipe should have a **1 to 2°** upward slope toward the outlet. This is to make sure all air is automatically removed from the entire array upon filling.

## 18 Roof Attachment Options



CAUTION

**Note the high thermal contraction and natural relaxation of HDPE:**

Collectors will contact (in length) by up to 10mm over time and 12mm thermally across temperature extremes. **Hence any fixing means must account for an ultimate contraction of 22mm in length per panel.**



CAUTION

**Key design principles when choosing a roof mounting means:**

- 1) Consider the high thermal contraction of HDPE
- 2) Panels should be as low down on the roof as possible to prevent the wind from catching the underside of panels.
- 3) The stainless steel straps should not be used to support loads, only as security against excessive wind speeds.

## 18.1 Tile Roof Mounting Frame



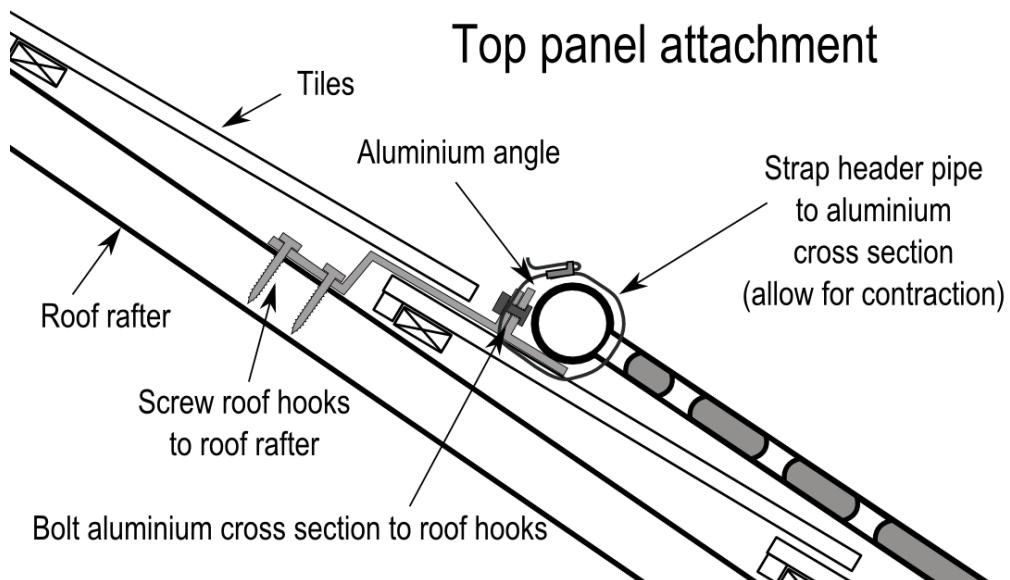
**WARNING**

For tile roofs we recommend using a minimum roof hook spacing of 600mm in the top and bottom row. Depending on your wind loading (see "Wind Proofing" section), angle of install and the dead weight of the collectors, you may require a higher density of roof hooks and/or a stronger Aluminium L-angle, if unsure please seek advice.

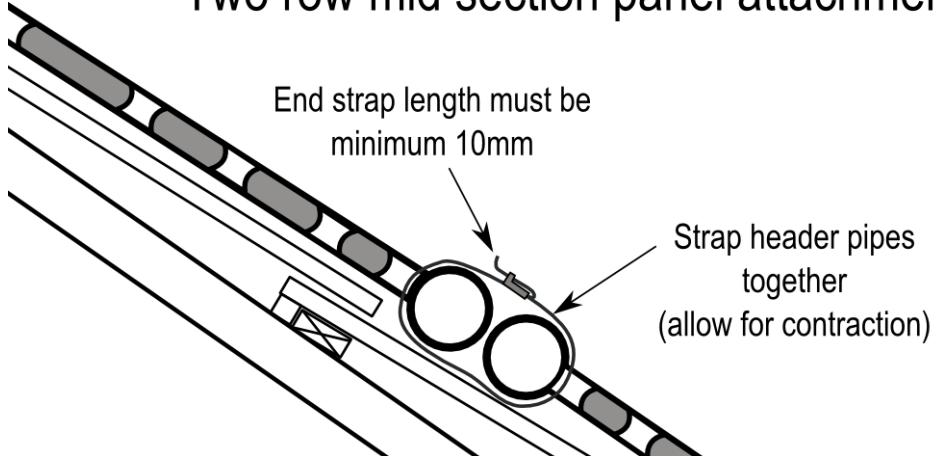


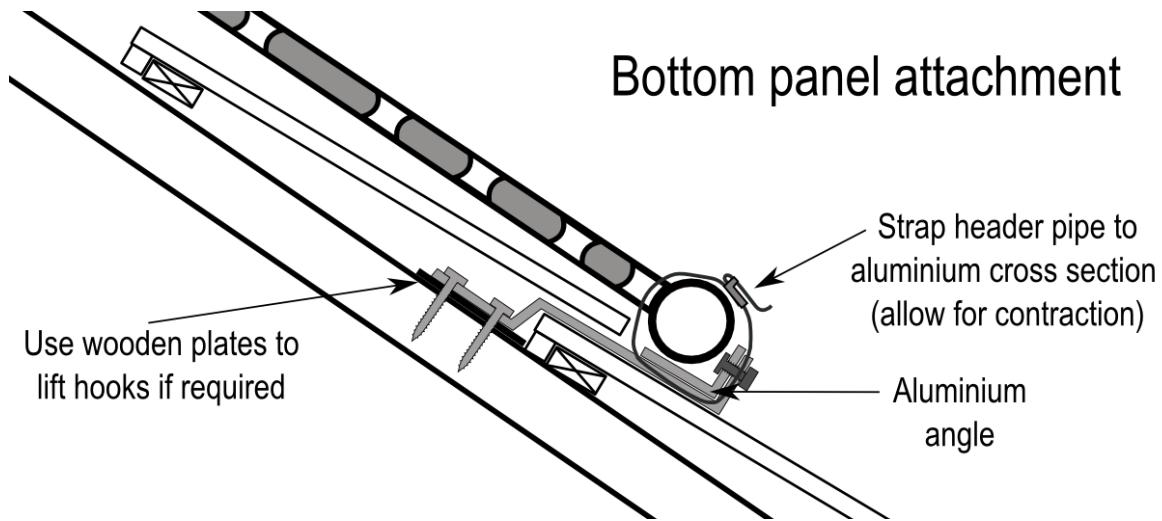
**WARNING**

The collectors can be walked on without damage, however for tile roofs with solar roof hook care should be taken not to step on or near a roof hook as you may crack a tile.

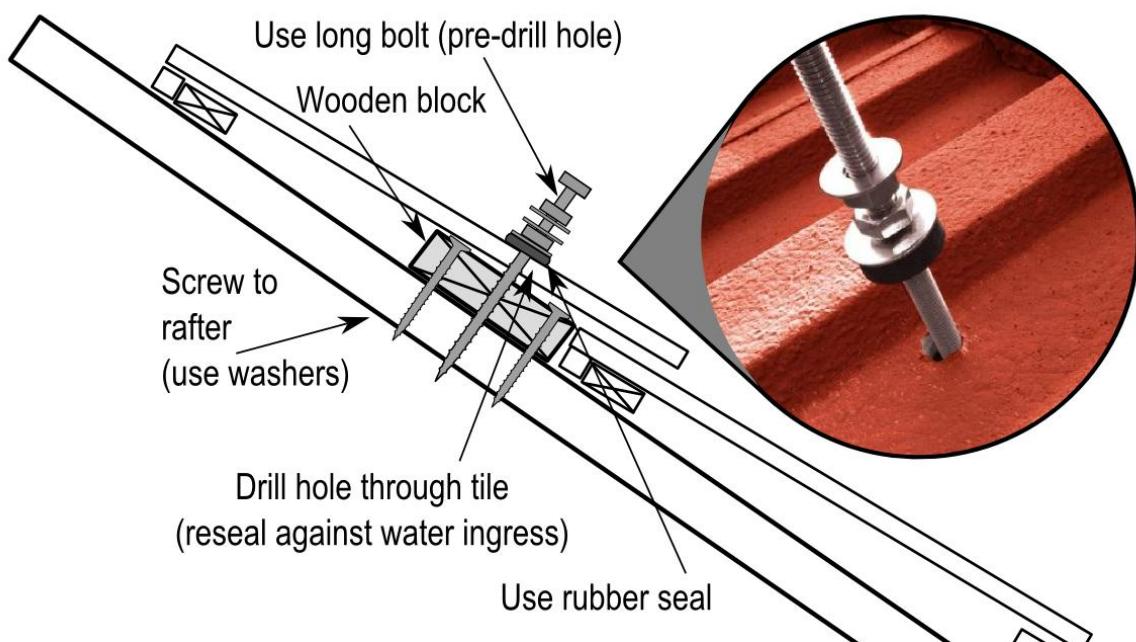


**Two row mid section panel attachment**





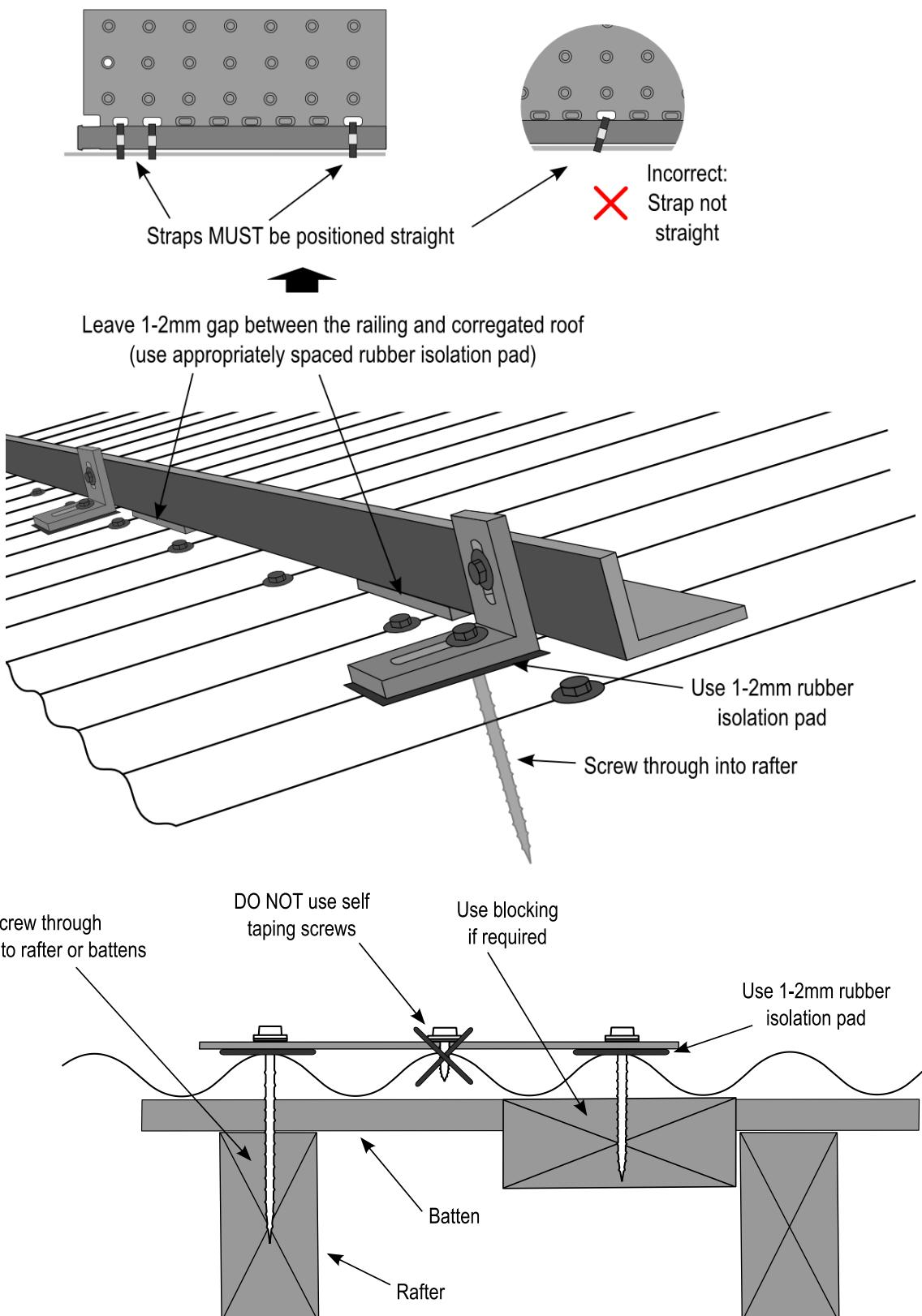
### Stainless steel cable anchor point option



## 18.2 Corrugated Metal Roof Mounting Frame



For metal roofs we recommend using a minimum roof hook spacing of 600mm in the top and bottom row. Depending on your wind loading (see "Wind Proofing" section), angle of install and the dead weight of the collectors, you may require a higher density of roof hooks and/or a stronger Aluminium L-angle, if unsure please seek advice.



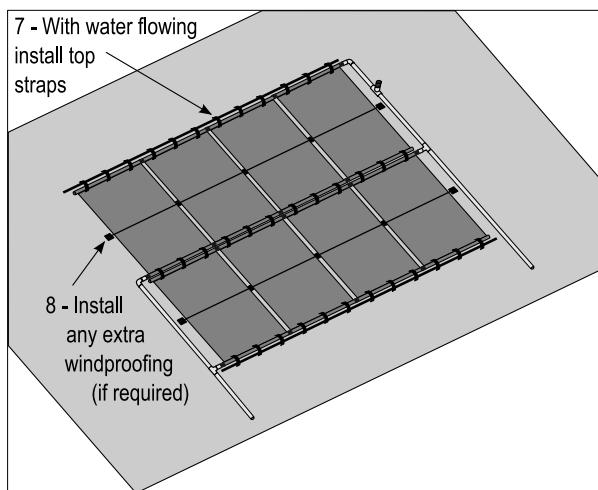
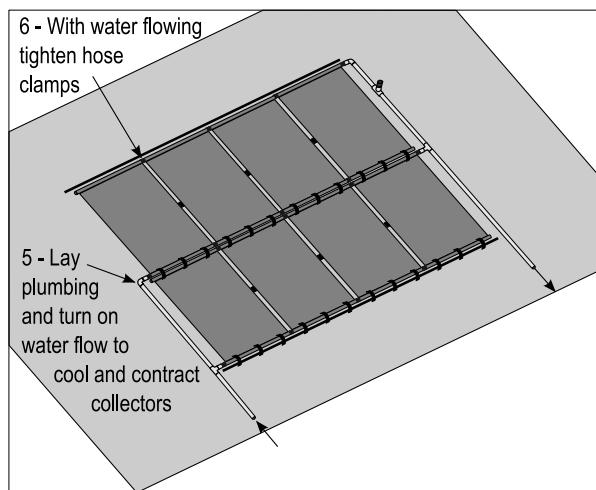
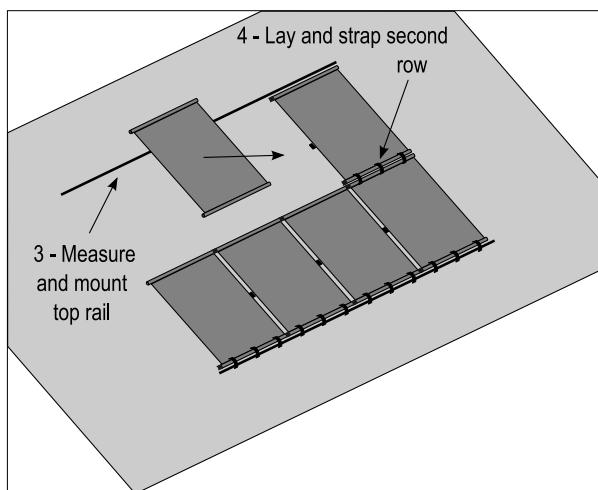
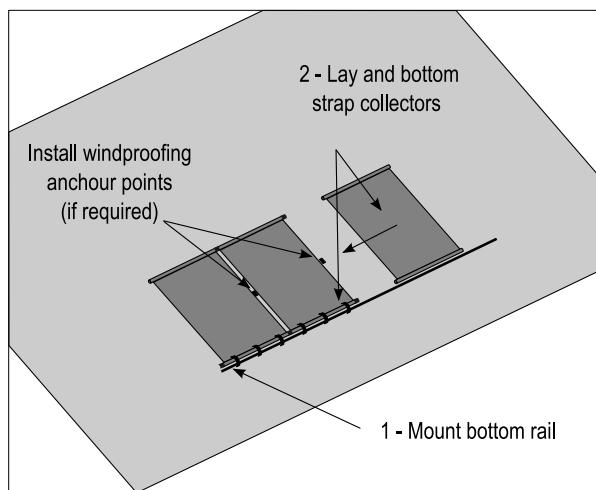
## 19 Mounting Procedure – “Seasoning Panels” and Minimizing Contraction Issues

Please be aware, collectors will **naturally age and contract by up to 10mm in length (and proportionally in width) per panel** in the first 1-4 years. Collectors also **thermally contract on a daily basis from a hot panel (80°) to a cold panel (0°) by up to 12mm in length (and proportionally in width) per panel**.

For collector arrays with **more than 8 panels in a row or two rows of panels** we highly recommend:

- 1) **“Seasoning” the panels by placing them in the hot sun for half a day on one side and half a day on the other side** to minimize any age contraction issues later.
- 2) **Compact panels pipe to pipe and apply and tighten hose clamps and fixing straps to cool panels only** (or with water running at low pressures, see Pressure Optimization section below), and never hot panels. This will minimize issues arising from thermal contraction at night.

We recommend the following mounting procedure:



**Apply and tighten hose clamps and fixing straps to cool panels only (with water running at low pressures, see Pressure Optimization section below) and never hot panels. Applying straps/clamps to hot panels can cause issues for large arrays when the collector array contracts significantly in the cool of the night.**

## 20 Collector Array Plumbing Connections



**BEFORE CUTTING - put aside two collectors per row with undamaged end caps.** For all remaining collectors cut the single end cap off using a sharp blade.



**WARNING**

Laceration hazard: Always cut away from your body and ensure no parts of the body are in front of the cutting blade.

**DO NOT** perform this task when you are tired or in a rush.

Plastic can be softened by heating.



Check all collector pipe connections for raised edges or grooves on the weld lines which could channel water and cause leaks. Shave any edges or grooves flat with a blade being careful not to cut into the pipe.



After inserting silicon joiners and hose clamps moderately tighten the clamps **using a hand screwdriver** with an 8mm hex socket. **Do not glue in silicon joiners** as this allows for some collector contraction movement over time. If there is a pin hole leak, a small amount of silicon can be used to seal.



**Tip**

Do not tighten hose clamp at this stage - HDPE has a high thermal expansion. **You'll need to re-tighten these with cool water running through the collectors at a later stage.** Make sure all nuts are accessible for future tightening.



**The inlet/outlet adapter PVC barbs should be glued into the silicon joiner with any neutral cure silicon.** A flat spatula type surface should be used to push silicon into the barbs indentations (as shown).

**Why?** PVC barbs can soften at extreme roof stagnation temperatures and contract slightly with clamp pressure. HDPE on the other hand, will not soften significantly at the maximum roof stagnation temperature of ~80°C.

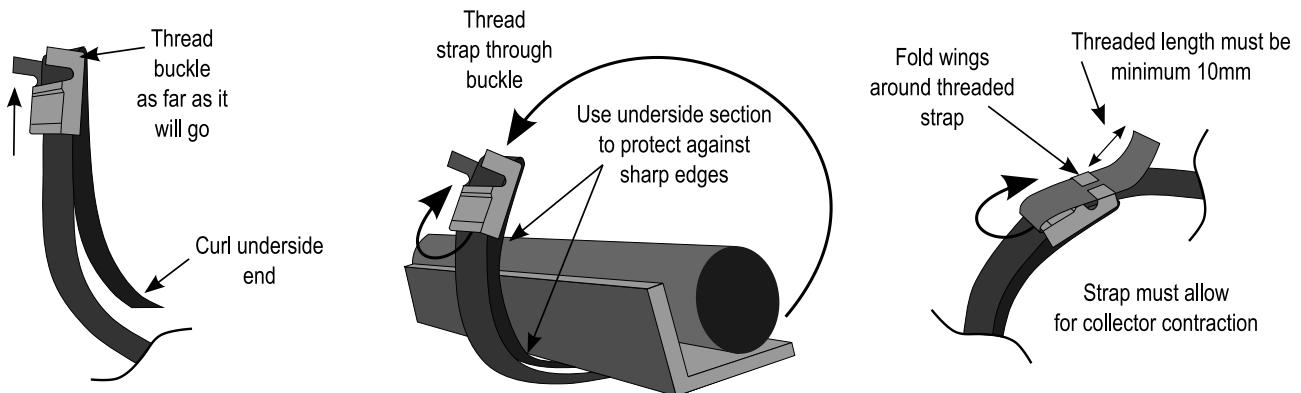
## 21 Roof Fixing Configurations



When working with power or hand tools always follow the safety instructions.

- Wear the recommended personal protective equipment, such as **gloves, safety glasses, respiratory and hearing protection**.
- Make sure electrical cables are kept away from any water and from foreign objects which pose a **potential cable severing or crushing hazard**.
- When using glues, solvents or sealing agents make sure **you know and seek the proper first aid** in case of an accident.

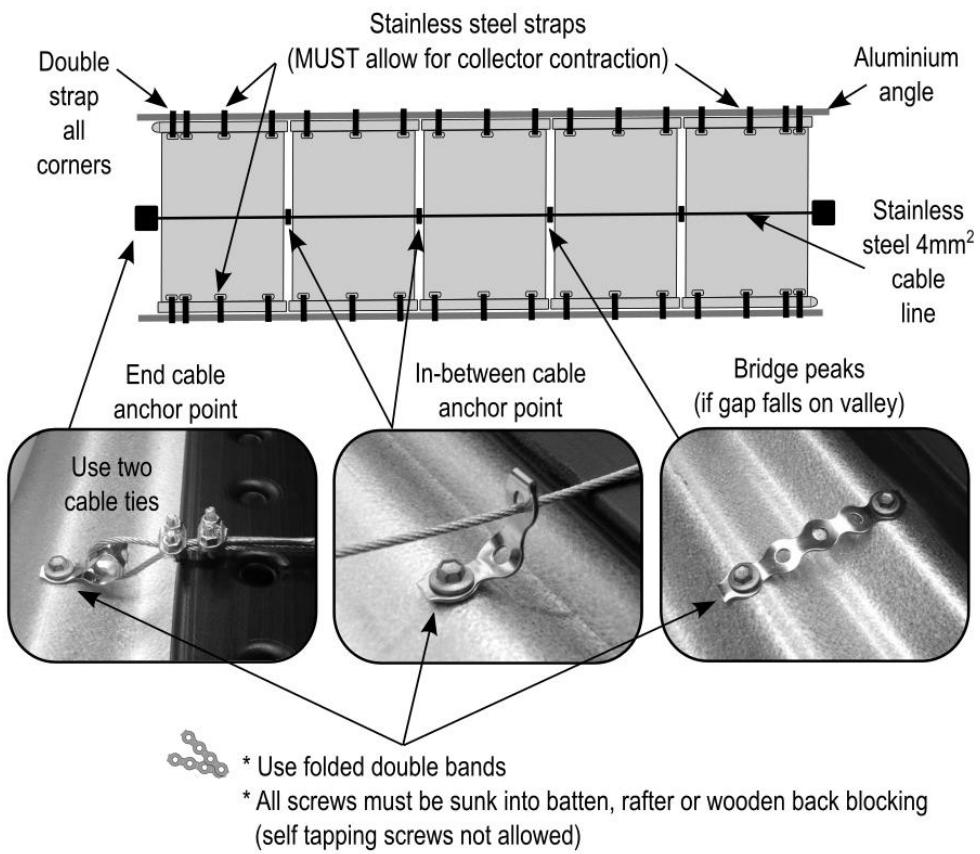
### 21.1 Application of the PVC Coated Stainless Steel Straps



WARNING

**IMPORTANT: DO NOT** over tighten stainless steel strapping. **Strapping must have sufficient play to allow for collector contraction.** For the installation of two rows between two aluminium channels top and bottom strapping should be loose enough to insert your **little finger** between the strapping and the header pipe. *Over tightened straps can experience tension and continual flexing of the metal due to the thermal contraction of the collectors. This can result in metal fatigue of roof fixings over time.*

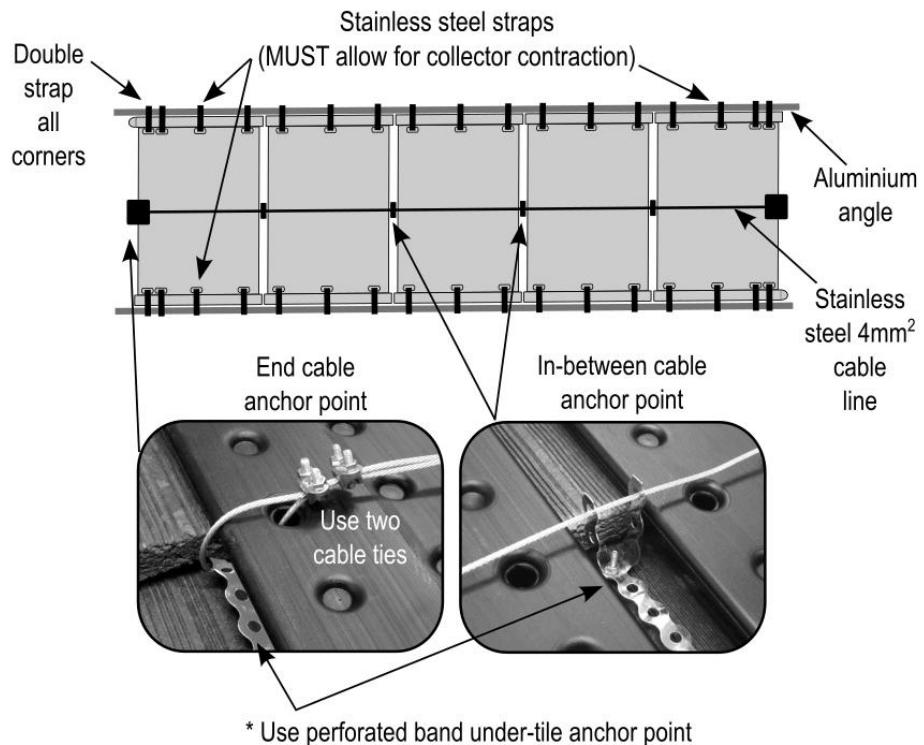
## 21.2 Single or Multi-Row Metal Roof Fixings for each Row



**WARNING**

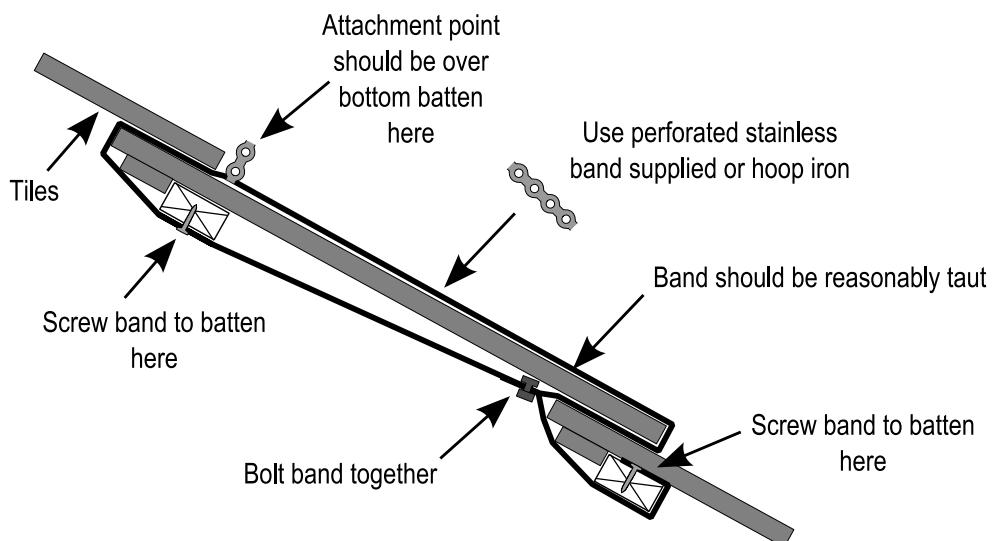
NOTE: For single or multi-row arrays in wind regions B or greater, aluminium L-angle MUST be run for the top and bottom of each row.

### 21.3 Single or Multi-Row Tile Roof Fixings for each Row



For single or multi-row arrays in wind regions B, aluminium L-angle MUST be run for the top and bottom of each row.

### 21.4 Perforated Band Under-Tile Anchor Point

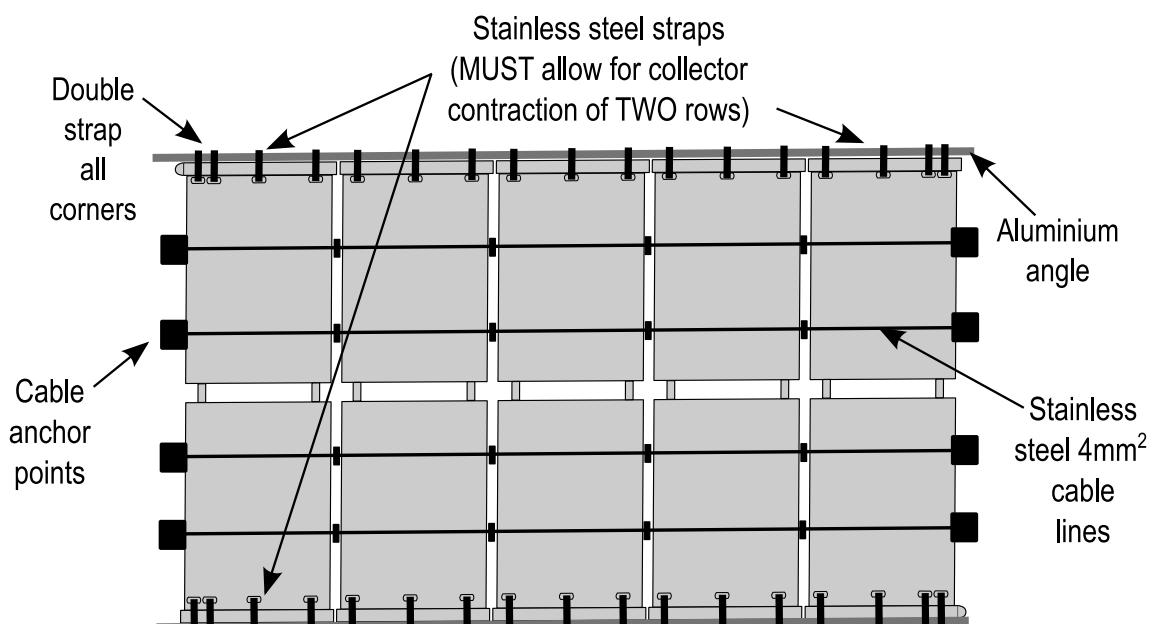
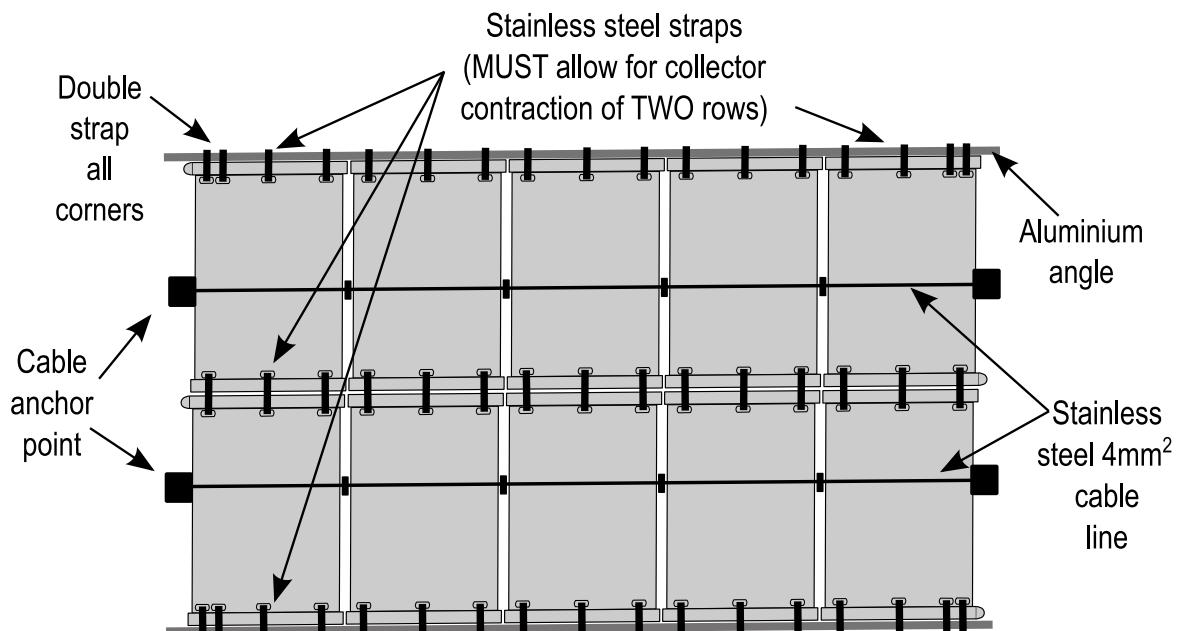


## 21.5 Alternate Two Row Roof Fixings (Wind Region A Only)



**WARNING**

Installation of two rows between two aluminium angles will require twice the expansion gap in the stainless steel straps. **We also highly recommend you “season” the panels before installation to removed some of the permanent contraction the panels are prone to.** “Seasoning” the panels involves laying the panels out in the sun for half a day on one side, then flipping over for the other side.

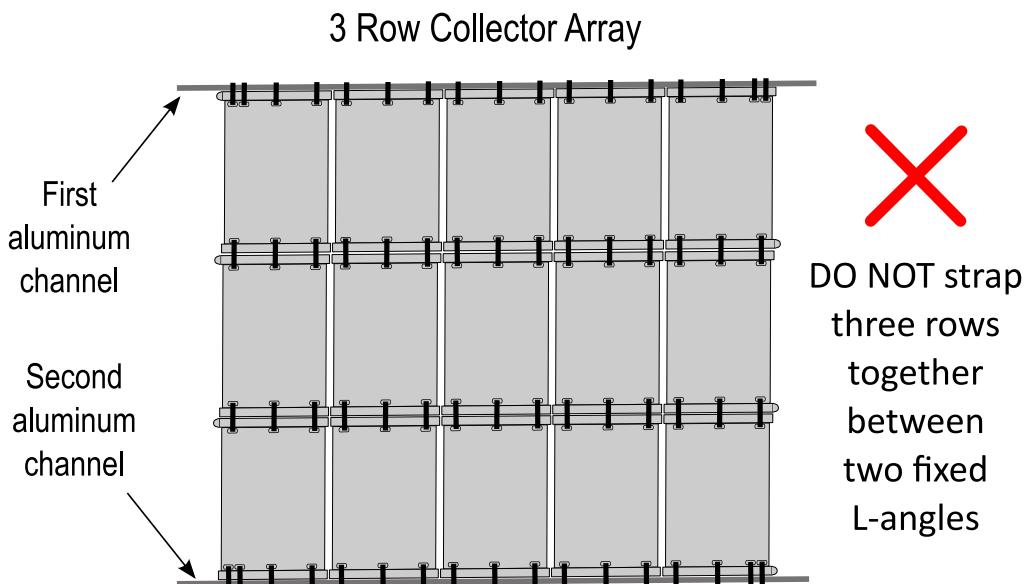


## 21.6 Three or More Row Roof Fixings



WARNING

**Due to the large potential thermal contraction across three rows the strapping of three or more rows of panels between one set of fixed top and bottom aluminium angles is not recommended.** Collector arrays consisting of three or more rows must have a pair of aluminium L-angles top and bottom for each row of collectors or at least for each pair of rows to allow for contraction.



## 22 Wind Proofing

Note: roof installation of these panels in Wind Region D is not recommended. This section provides general advice on wind loadings. If you have any doubt about your wind loadings please contact [info@EcoOnline.com.au](mailto:info@EcoOnline.com.au)

### 22.1 Ultimate Peak Wind Loadings per Panel

The following Tables specify the ultimate peak uplift any single panel can experience in a 1 in 500 year extreme storm or cyclone event according to Australian Standard 1170.2 - 2011 (Amend 2 Dec 2012). These tables assume:

- 1) Panels are mounted on (touching) the roof structure - or no more than 20mm off the roof surface
- 2) Panels are situated away from a roof edge or corner
- 3) Installation is on a first story roof
- 4) Shortest side length of the building is more than twice the average building height (i.e. flat building)

If your installation falls outside of these assumptions please contact [info@EcoOnline.com.au](mailto:info@EcoOnline.com.au) for alternative loadings.

Ultimate Peak Uplift Loadings Per Panel in Wind Region A (Kg)					
Region A	< 10° Roof Pitch	12.5° Roof Pitch	15° Roof Pitch	17.5° Roof Pitch	> 20° Roof Pitch
Terrain Category 1	120 Kg	110 Kg	95 Kg	90 Kg	80 Kg
Terrain Category 2	100 Kg	90 Kg	80 Kg	70 Kg	65 Kg
Terrain Category 2.5	90 Kg	80 Kg	70 Kg	65 Kg	60 Kg
Terrain Category 3	85 Kg	75 Kg	65 Kg	60 Kg	55 Kg

Ultimate Peak Uplift Loadings Per Panel in Wind Region B (Kg)					
Region B	< 10° Roof Pitch	12.5° Roof Pitch	15° Roof Pitch	17.5° Roof Pitch	> 20° Roof Pitch
Terrain Category 1	195 Kg	175 Kg	150 Kg	140 Kg	130 Kg
Terrain Category 2	160 Kg	145 Kg	125 Kg	115 Kg	105 Kg
Terrain Category 2.5	150 Kg	130 Kg	115 Kg	105 Kg	100 Kg
Terrain Category 3	135 Kg	120 Kg	105 Kg	95 Kg	90 Kg

Ultimate Peak Uplift Loadings Per Panel in Wind Region C (Kg)					
Region C	< 10° Roof Pitch	12.5° Roof Pitch	15° Roof Pitch	17.5° Roof Pitch	> 20° Roof Pitch
Terrain Category 1	290 Kg	255 Kg	225 Kg	210 Kg	190 Kg
Terrain Category 2	240 Kg	215 Kg	185 Kg	170 Kg	160 Kg
Terrain Category 2.5	220 Kg	195 Kg	170 Kg	155 Kg	145 Kg
Terrain Category 3	200 Kg	175 Kg	155 Kg	145 Kg	130 Kg

As an example if you are in **Wind Region B** and **Terrain Category 3** and have a **roof pitch 12.5°** then any single panel in your collector system could experience momentary peak uplifts of **~120Kg** per panel. You should make sure your

panels and fixing components can withstand your relevant loadings. See below for Terrain Category definitions.

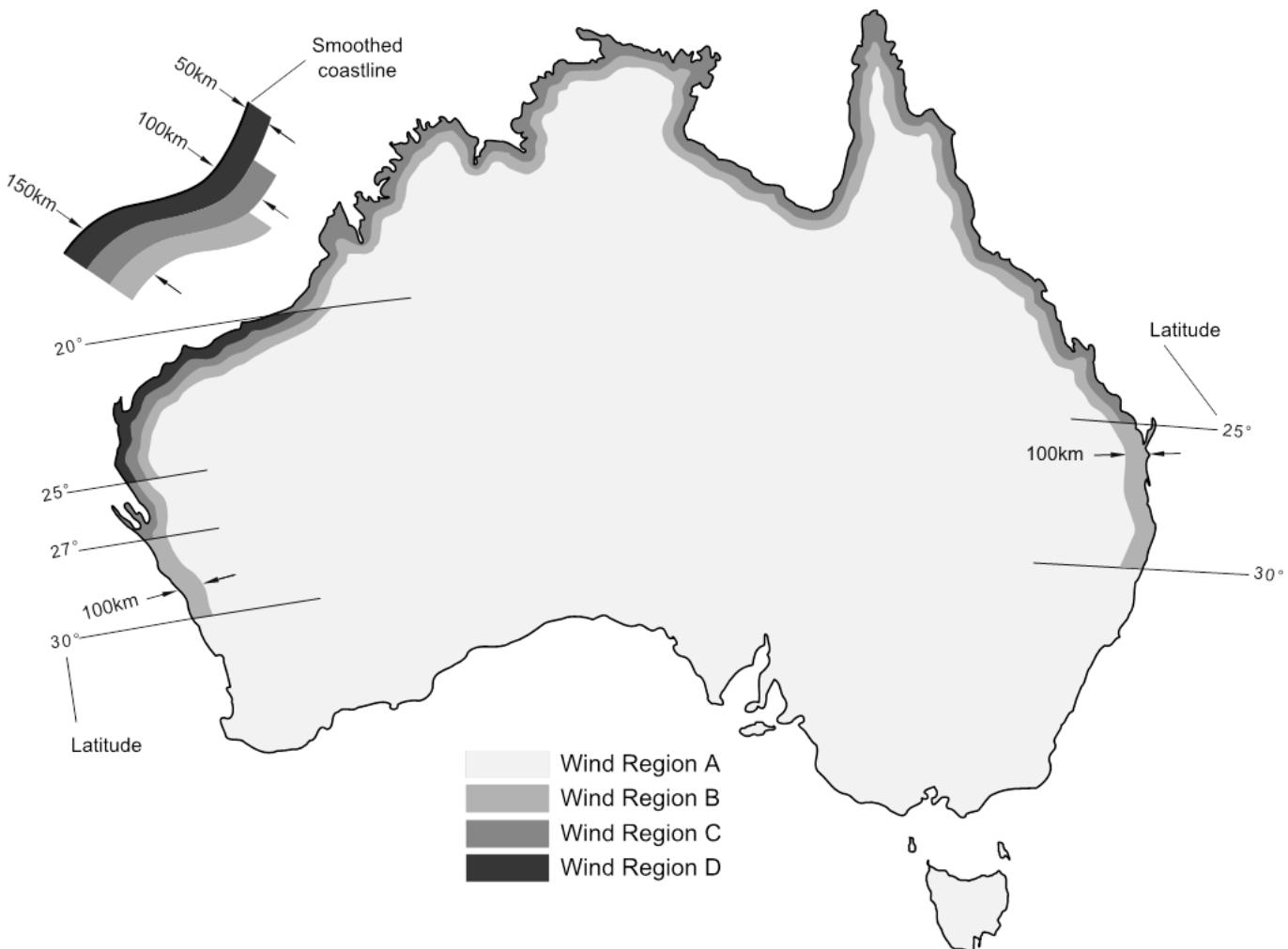


Note: Installations involving a second story roof or higher, or houses on hills, or panels mounted 50mm or greater above the roof structure have higher potential wind loadings. Please contact [info@EcoOnline.com.au](mailto:info@EcoOnline.com.au) for ultimate wind loadings based on your details.

## 22.2 Terrain Category Definitions

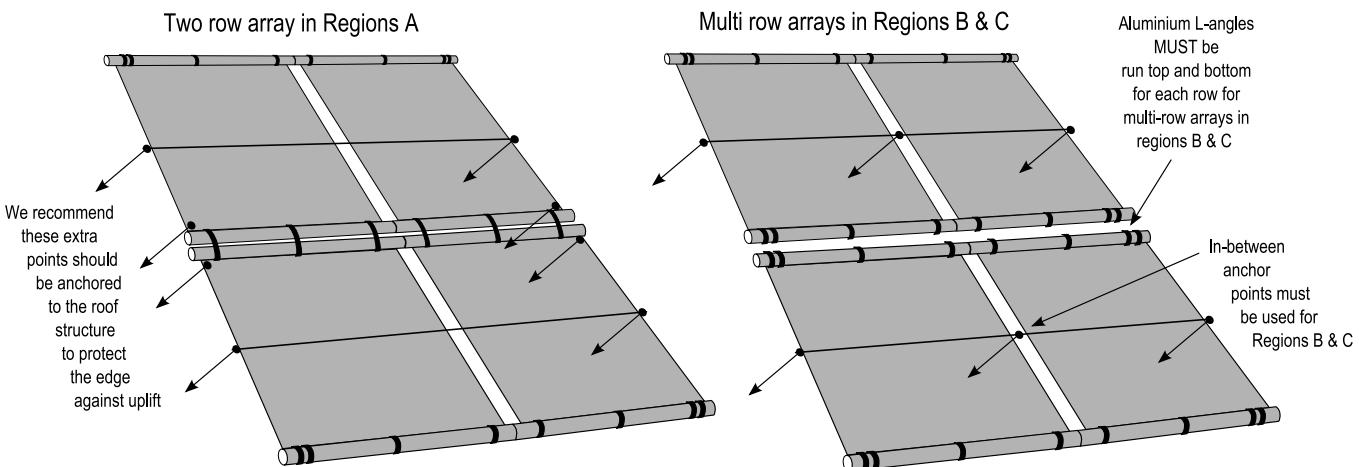
- **Terrain Category 1:** Open terrain few obstructions. Example flat, treeless, poorly grassed plains.
- **Terrain Category 2:** Open terrain with scattered obstructions having heights from 1 .5m to 5m, with at least two building type obstructions per hectare. Example farmland and cleared subdivisions with isolated trees.
- **Terrain Category 2.5:** Averaged intermediate between Terrain Category 2 and Terrain Category 3
- **Terrain Category 3:** Numerous closely spaced building obstructions having heights from 3m to 10m with at least 10 house-size obstructions per hectare. Example fully developed suburb or light industrial estates.

## 22.3 Wind Region Definitions



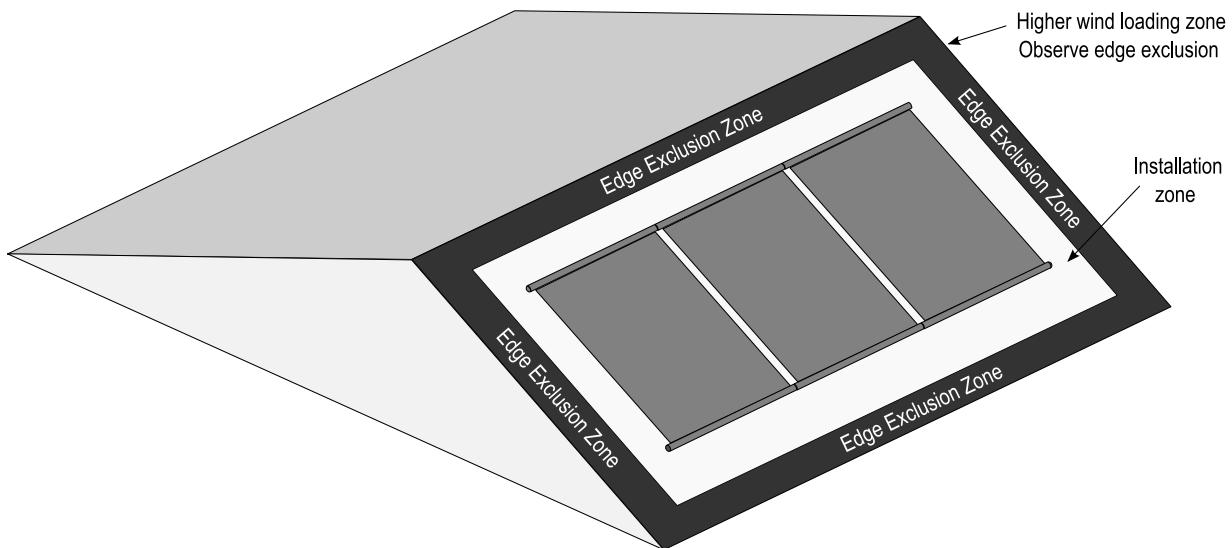
Coastal region boundaries are smooth lines set in from a smoothed coastline by 50km, 100km or 150km lines.

#### **22.4 Frequency of Extra Fixings for Different Regions**



<b>For ultimate wind loadings (see Tables above):</b>	<b>Extra Fixings Required</b>
Less than 70Kg per panel	Stainless guide line is not required (but still recommended)
Greater than 70Kg per panel	Stainless guide line is required across each row
Greater than 120kg per panel	Stainless guide line is required <b>with</b> in between anchor points

## 22.5 Roof Edge Exclusions Zones



## WARNING

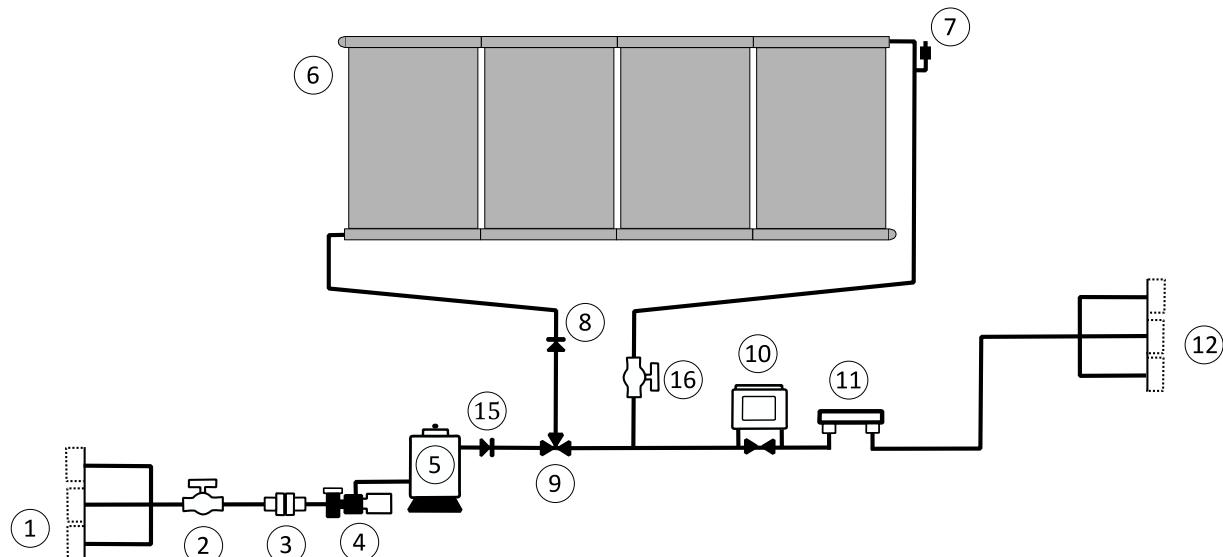
Note: Collector installations within a roof edge exclusion zone require **2 X** the fixing strength in that local area. Collector installations within a roof corner exclusion zone require **3 X** the fixing strength in that local area.

## 23 Plumbing



When installing PVC lines, attention should be given to the minimum spacing for pipe supports and thermal expansion of long length of pipe work and the stress this produces on joins. For complicated installations we recommend a professional installer install the system, unless you are confident of the work to be performed.

### 23.1 Configuration 1: Manual/Timer/3-Way Motorized Ball Valve System



#### LEGEND:

1 - Pool suction	7 - Vacuum release valve	13 - Dedicated solar pump
2 - Ball valve	8 - Check valve (with 6mm hole)	14 - Solar circuit strainer
3 - Union socket/join	9 - 3 Way diverter valve	15 - Check valve
4 - Filter pump	10 - Auxiliary heater	16 - Ball valve brake (if required)
5 - Filter	11 - Chlorinator	
6 - Solar collector array	12 - Pool return	

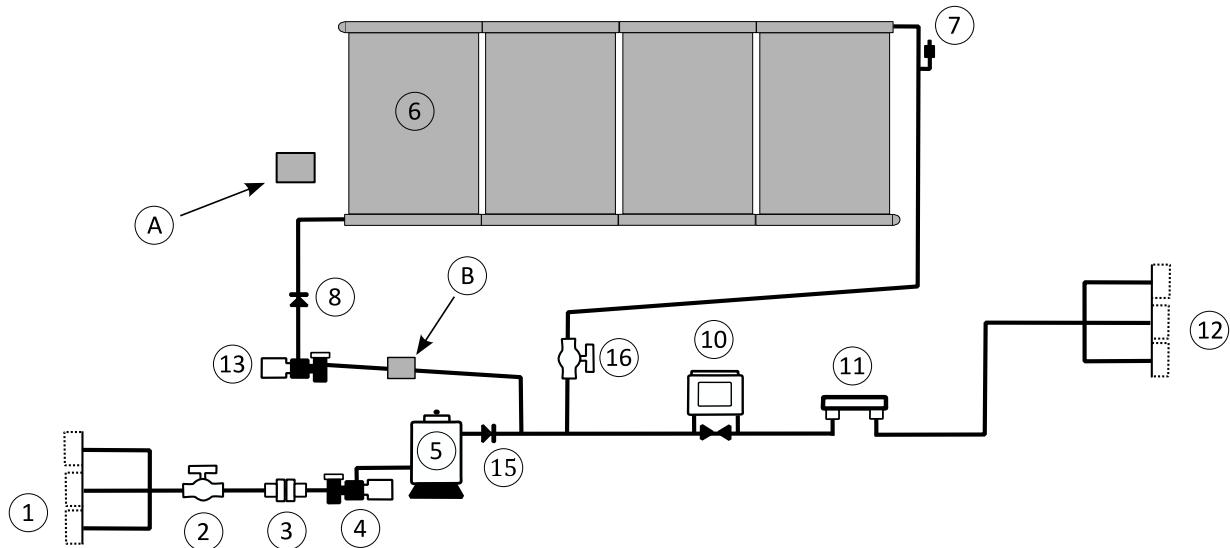
Advantages:	Disadvantages:
<ul style="list-style-type: none"><li>* Manual system requires no extra pump required</li><li>* Only filtered water runs through collectors</li><li>* Can be retrofitted to pools that don't have separate solar provisions</li><li>* Motorized three way valve and controller can be retrofitted later</li></ul>	<ul style="list-style-type: none"><li>* Manual system, needs to be turned off/on or on timer</li><li>* Large main filter pump needs to run all day for solar</li><li>* Requires specialized motorized valve and controller to automate</li><li>* Increases pressure and decreases flow rate in the filter system</li></ul>

**Configuration 1:** Manual or motorized three way valve (9). (Note: automatic controls are omitted for clarity).



For manual pool heating systems running off a main pool filter pump, please check that the pump is large enough to accommodate the extra load of supplying water to the collectors at the required pump height.

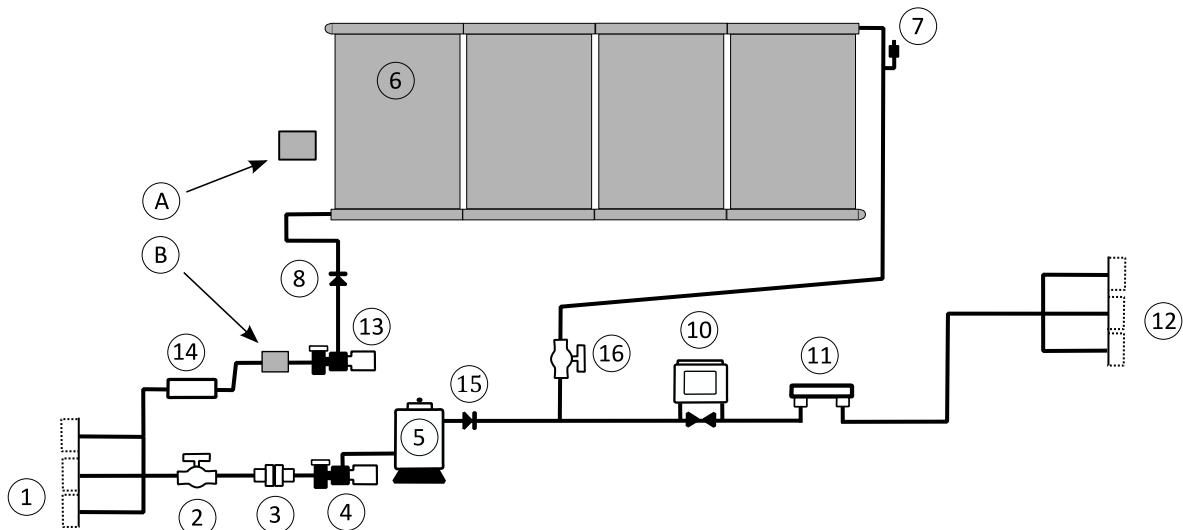
## 23.2 Configuration 2: Booster/Retrofit System



Advantages:	Disadvantages:
<ul style="list-style-type: none"> <li>* Less extra plumbing is required for solar</li> <li>* Only filtered water runs through collectors</li> <li>* Does not require separate solar suction provisions</li> </ul>	<ul style="list-style-type: none"> <li>* Requires second pump and special controller</li> <li>* Large main filter pump + solar pump need to run all day for solar</li> </ul>

**Configuration 2:** Solar booster pump locked to run with filter pump - requires specific controller Dontek V7RTS.  
 (Note solar pump 13 should of lower flow than filter pump 4).

### 23.3 Configuration 3: Independent/Separate System



\* Note A and B are the recommended temperature sensor installation zones for the Dontek controller

Advantages:	Disadvantages:
* More energy efficient as a small solar pump runs independent of the large main filter pump	* Requires separate solar suction provisions to be installed

**Configuration 3:** Solar pump can run independent of filter pump.



**WARNING**

This system requires separate/independent Australian Standard approved suction and return lines going into your pool. **If you need to retro fit these you must contact a pool builder.**



**Read Carefully**

An inline mesh strainer (14) is recommend for this configuration, however the filter basket on a pump is sufficient for OKU panels.

## 24 Frost Proofing and Winterization



### Read Carefully

The use of a **water tight** non-return valve (8, see plumbing diagrams) will prevent drain down which could result in water freezing inside PVC piping in frost prone areas. Always use a **non-water tight non-return valve** in areas which can experience below zero freezing conditions. Non-water tight non-return valves can be created by drilling a small (6mm) hole shutter flap to allow for slow drain down.

Please note, while your potable HPDE/Silicon collector array does not require regular winter flushing, **your solar booster pump may require winter flushing**. If this is the case and you do not want to run your system over winter you can winterize your system by draining the solar side of the system, disconnecting the solar booster pump and flushing the pump with clean water for storage over winter.

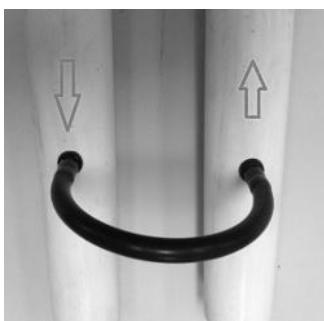


### CAUTION

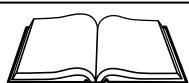
PVC piping should be installed with a slope such that all water drains out of the piping to when the pump stops to ensure a freeze proof system. There should be no U-bend water traps - these can freeze over and burst plumbing lines in the winter. Note: PE lines are not affected as these are frost impervious.

### 24.1 Drain/Equalizer Tube

A drain tube can be used to drain non-self draining sections of PVC piping in frost prone areas. In some cases where there are issues with pump priming and a perfectly sealing non-return valve (8) is required; a drain tube can be installed on the supply and return solar lines leading up to the roof approximately one metre above pump level to create an alternative drain down mechanism. Please request this component if you require it.



To install, drill into the PVC pipe using an 8.5mm drill. **Note: PVC plastic should be preheated to 40°C using a heat gun or it may split when drilling.** Insert the rubber grommet into the hole tapered end first.



### Read Carefully

Independent systems with a drain tube anywhere in the system **MUST** be installed with a fine (<0.5mm) strainer, or else this tube may get blocked up.

## 25 Optimizing Collector Pressure

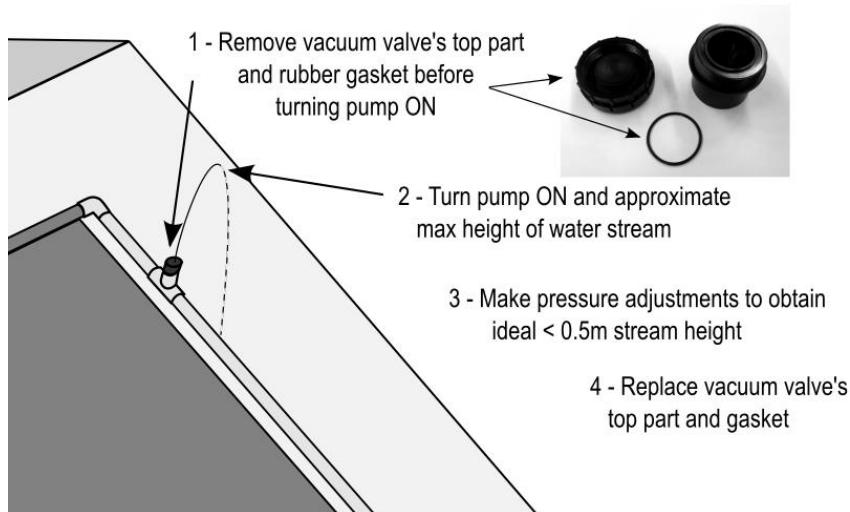


**Do not expose the collector array to temporary pressures greater than 16 psi (110kPa).**

Note: if for whatever reason water flow is fully blocked, a pump with a 15 meter head pressure will generate 150kPa at ground level, 100kPa at 5m and 50kPa at 10m.

**Why?** Plastic longevity is strongly dependent on pressure fluctuations and temperatures.

### Pressure Optimization Test



Stream height	Collector Pressure	Pressure Adjustment Advice
No flow	Negative	Install ball valve brake (16) (see plumbing diagrams) to increase back pressure in return line
0 - 0.5 Meter	0 - 7.5 kPa	Pressure is ideal no action required
1 Meter	15 kPa	Pressure is still okay but not ideal
1.5 Meter	22.5 kPa	Excessive pressure - install extra pool returns or reduce pump power or install flow limiting ball valve

### 25.1 Negative Pressure & Air Bubble Issues

If the pump height is substantial, it may be the case that your pump cannot **positive pressurize** the vacuum release valve. In this case you will get undesirable constant bubbling in the outlet to the pool as the vacuum release valve is drawing in air. If this happens you will need to install the PVC ball valve down draft brake (16) on the return line, see plumbing diagrams.



Read Carefully

Use the below procedure for solving air bubbling issues, DO NOT remove or drop the level of the vacuum release valve. The vacuum release valve MUST be mounted above the lowest point on the collector array on the roof to ensure collectors are not pressure worked.

The following procedure need be carried out only once during installation. This procedure can be carried out with the vacuum valve's top (and gasket removed).

- 1) Constrict flow in the return line using the ball valve brake (16, see plumbing diagrams) lever handle by a small increment.

- 2) If after some time air bubbling continues, constrict flow by another small increment.
- 3) If air bubbles stop reliably at this point then the vacuum breaker is now at the required positive pressure.
- 4) Leave the ball valve brake in place at this constriction permanently.
- 5) If the required constriction is greater than 50% you will need a stronger pump.

## 25.2 Adjusting the Three Way Valve for Manual Systems

The following procedure for manual system Configuration 1, need be carried out only once during installation. This procedure can be carried out with the vacuum valve's top (and gasket removed).

- 1) Open the three way ball valve (9, see plumbing diagrams) using the lever handle by a small increment.
- 2) Wait to see if there is sufficient flow and back pressure to create positive pressure at the vacuum release (7).
- 3) If after some time air bubbling is still present in the return line, open the three way valve (9 see plumbing diagrams) by another small increment.
- 4) If air bubbles stop reliably at this point then the vacuum breaker is now at the required positive pressure.
- 5) Fix in place a back stop on the ball valve lever handle at this travel point, as this will be your maximum opening point for your three way valve when turning the heating system on again.

## 25.3 Optimizing Pressure for Oversized Pumps



**Read Carefully**

Over-sized pumps and flow rates could potentially limit the lifetime of your OKU collectors due to pressure working of collectors. Note, the return line to the pool MUST be unconstricted, with an appropriate number of pool outlets so as not to create significant back pressure in the panels.

For an over-sized solar pump (13, see plumbing diagrams) we recommend the following procedure, carried out only once during installation, to limit pressures inside the panels. This procedure can be carried out with the vacuum valve's top (and gasket removed).

- 1) Removed any potential constrictions in the return line going back into the pool such as eyeballs in the return outlets.
- 2) If pressure is still too great (as measured by the above "Pressure Optimization Test") install a limiting ball valve just above or below the non-return valve (8, see plumbing diagrams).
- 3) Turn the solar pump on with the limiting ball valve fully open.
- 4) Constrict the ball valve in small increments until stream height is between 0.5m to 1m in height.
- 5) Replace vacuum valve's top part and gasket.
- 6) If the required limiting ball valve constriction is too great we recommend a smaller pump.

## 26 Checking for Balanced Water Flow through All Collectors

At midday with the sun shining on the collectors and the pump operational, run your hand over every part of each collector in the array. The bottom face of each collector should be cool to the touch while the top of each collector should be slightly warmer to the touch. No part of any collector should be hot to the touch. **Hot spots indicate that there is no water flow through this part of the collector.**



Tip

During operation the outlet water flow should be strong with a temperature no greater than about 1-5°C that of the inlet. Faster flows rates will result in a lower temperature difference across the collector array and hence will maximize collector efficiency; however this should be balanced against electricity usage. A 3-5L/min/m<sup>2</sup> flow is ideal.

## 27 Service and Maintenance Schedule



**Important:** before carrying out any system maintenance you MUST check for any manual and or technical service bulletin updates and download the latest installation manual from [www.EcoOnline.com.au/downloads](http://www.EcoOnline.com.au/downloads)

Maintenance Issue - Service Procedure	1 <sup>st</sup> Month	1 <sup>st</sup> Quarter	Annual Checks	After 5 Years
<b>Plastic Barbs Relaxing</b> - All the stainless steel hose clamps may need retightening as plastic relaxes overtime.	X		X	
<b>Silicon Joiner Chemical Attack</b> – Disconnect a single silicon joiner, dry and check that the water exposed inside section has not turned grey or become unfirm to the touch. This would indicate chemical attack from a pH lower than 7. Replace as needed.		X	X	
<b>Stainless Strap Fatigue</b> - Inspect all stainless steel fixing straps for wear of PVC coating around the sharp Aluminium L-angle edge, which would indicate fatigue working of straps. Replace as needed.			X	
<b>Mounting Frame</b> - The integrity of the collector mounting frame and wind proofing components should be checked for any degradation. Replace as needed.			X	
<b>Plumbing Degradation</b> – Plumbing lines and fittings should be checked for signs of UV and/or chemical damage. Replace as needed.			X	
<b>Vacuum Release Valve</b> – The vacuum release valve (7) is a critical system component. It should be checked that it is functioning correctly and that collectors drain fully when the pump stops. The collectors and/or piping should never appear collapsed (concave) by negative pressure.			X	
<b>Non-Return Valve</b> – The non-return valve (8 see plumbing diagrams) is a critical system component. It should be checked that the 6mm hole drilled in the flap has not become blocked and that the collectors drain fully when the pump stops.			X	
<b>Collector Plastic Contraction</b> – Collectors can relax and contract by 10mm in length over the initial first few years. It should be checked that the stainless steel straps or fixings have not become too tight as a result. If required straps will need to be loosened slightly. This check should be carried out when the collectors are cool (water flowing).			X	
<b>Debris Accumulation on Roof</b> – Check that there is no build up of debris around pipe work or collectors, and that water has a clear path to run down.			X	
<b>Debris Accumulation in Collectors</b> – Inspect the inner of the collectors. Depending on conditions collectors may need to be flushed with a suitable cleaning agent for debris accumulation after many years of use.				X

## **27.1 Collector Puncture Repair Procedure**

Drill out the puncture using a sharp drill bit (being careful not to drill into the opposite wall). Inject chlorine resistant pool silicon into the collector inner to create a ~10cm inner silicon disk plug. Wait one day before re-pressurizing.

## **28 Important Installation Check List**

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Your installation must have the following elements.

- The top header pipe was installed with a 1 to 2° slope toward the outlet, or at the least perfectly level.
- Aluminium channel was laid top and bottom of each row or maximum two rows.
- The stainless steel strapping was installed with sufficient play to allow for collector contraction.
- Ultimate uplift wind loadings were considered and panels secured appropriately.
- A hot spot check was performed. All collectors are cool during full sun exposure (top of panels may be warmer).
- Smooth flow is achieved; no air bubbling is present after initial purging.
- The pressure optimization procedure was carried out.
- Collectors and PVC plumbing lines were laid at such an angle so that all water drains from them.
- A fast opening vacuum release valve MUST be installed on the roof on the return line.
- A non-return valve was installed (with a small 6mm hole drilled in the flap).